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PACHAUG POND DAM (CT..(U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV SEP 78

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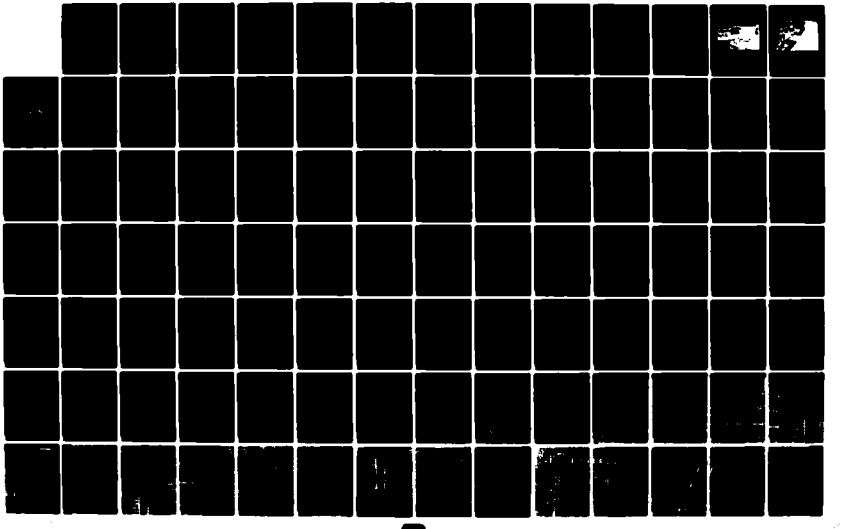

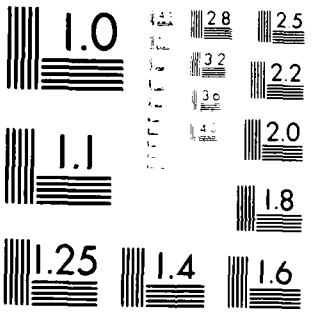

THAMES RIVER BASIN
GRISWOLD, CONNECTICUT

PACHAUG POND DAM
CT 00663

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

SEPTEMBER 1978

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Thames River Basin
Griswold, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Pachaug Pond Dam is an earth embankment which has a maximum height of 17.0 ft. and is approximately 770.0 feet long. The dam is considered to be in fair to good condition. A spillway design test flood 24,800 cfs (equal to the PMF) will overtop the dam by approximately 4.0 feet.

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PACHAUG POND DAM

CT 00663

THAMES RIVER BASIN
GRISWOLD, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

APPROVED:

_____

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

DATE: _____

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 - INSPECTION REPORT

IDENTIFICATION NO.: CT00663

NAME OF DAM: PACHAUG POND DAM

TOWN: GRISWOLD

COUNTY AND STATE: NEW LONDON COUNTY, CONNECTICUT

STREAM: PACHAUG RIVER

DATE OF INSPECTION: 22 MAY, 1978

BRIEF ASSESSMENT

Pachaug Pond Dam is an earth embankment dam which was constructed around 1888. The dam has a maximum height of 17.0 feet and is approximately 770.0 feet long. In plan view the dam consists of a 200.0 ft. long straight earth embankment on the left side, a 121.0 ft. long cut stone masonry spillway section and a 450.0 ft. long earth embankment on the right side. Embankment slopes are generally grassed with slopes of 2.0 H to 1.0 V for both upstream and downstream faces. One drawing of recent rehabilitation work at the spillway and gatehouse is the only engineering data available from the Owner or State Offices with regard to the design, construction, or repairs of this dam.

Due to its age, Pachaug Pond Dam was neither designed nor constructed by approved state of the art methods. Based upon the visual inspection at the site, the lack of engineering data available, and no operational or maintenance evidence, there are areas of concern which must be corrected to assure the long term performance of this dam. The dam is considered to be in fair to good condition. The dam embankment has received limited recent maintenance. Erosion from waves or trespass has occurred on the unprotected upstream face. Rotting tree stumps are located on both the upstream and downstream faces. Seepage is emerging at several locations along the downstream toe. Maintenance has been intermittent.

Hydraulic analyses indicate that the existing spillway can discharge a flow of 6400 c.f.s. at Elev. 167.0 (top of Dam). A spillway design test flood of 24,800 c.f.s. (equal to the probable maximum flood) will overtop the dam by approximately 4.0 feet. A storm event with a 50 year recurrence frequency will develop still water surface levels in Pachaug Pond equal to the top of dam disregarding wave surge and ride up. Due to the potential for overtopping, it is recommended that a definite plan for surveillance and a warning system be developed for use during periods of unusually heavy rains and runoff.

It is recommended that the owner obtain the services of an engineer experienced in the design of earth dams to evaluate and design a seepage monitoring system to effectively collect and monitor these flows; develop a program for the procedure and timely removal of rotting tree stumps and roots along both upstream and downstream slopes of the dam; further, to analyze the embankments with regard to the spillway test flood for slope protection and freeboard allowances. A more detailed investigation should be made of the hydraulic and hydrologic aspects of the site to determine the impact of upstream dam failures and storage at Pachaug Pond because of the large contributing drainage area.

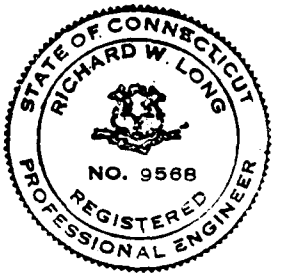
It is suggested that engineering services be obtained in order that the above recommendations be implemented within a 2 year period after receipt of the Phase I Inspection Report. Alternatives to these recommendations would include reducing the Pachaug Pond water levels during periods of intense storm activity or providing additional flood control capacity in the upper basin.

C-E MAGUIRE, INC.

by

Richard W. Long

Richard W. Long, P.E.
Vice President



This Phase I Inspection Report on Pachaug Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL C. COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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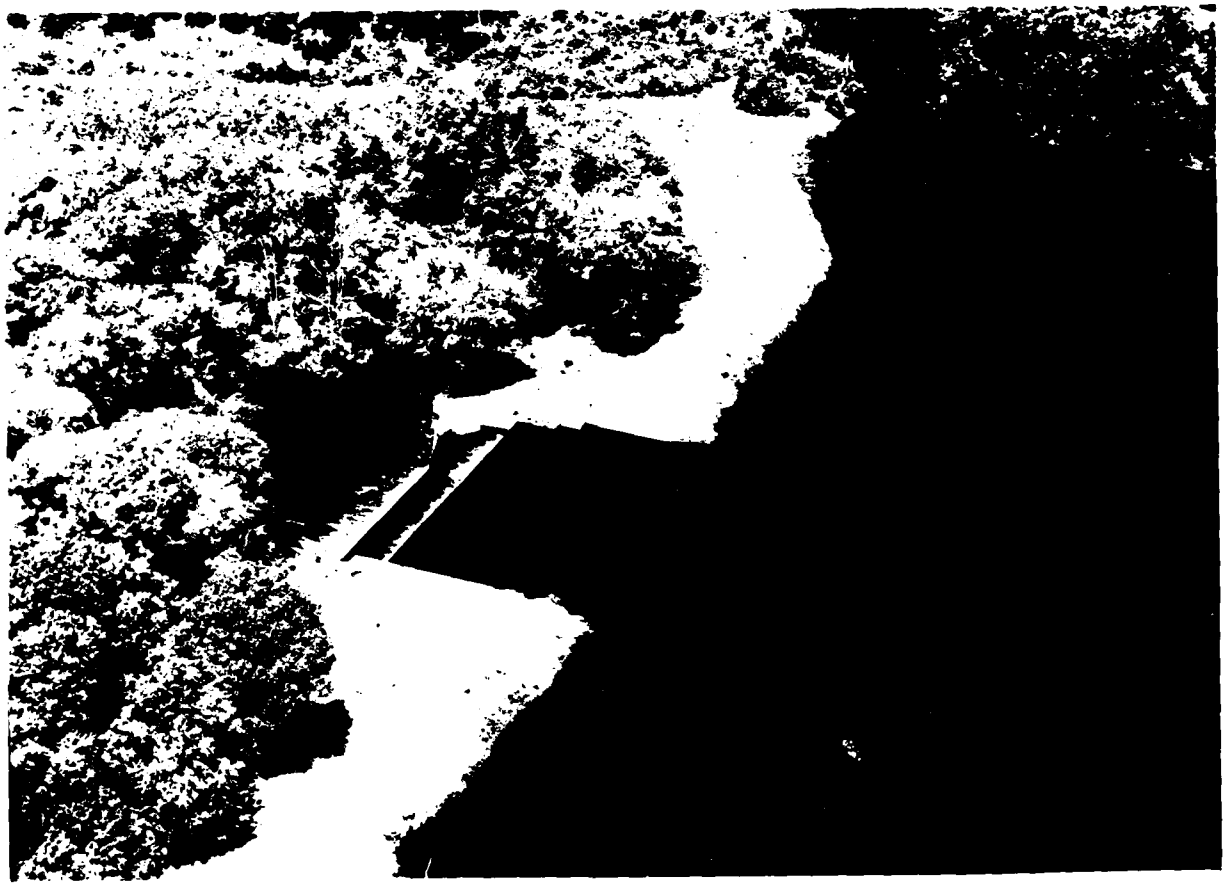
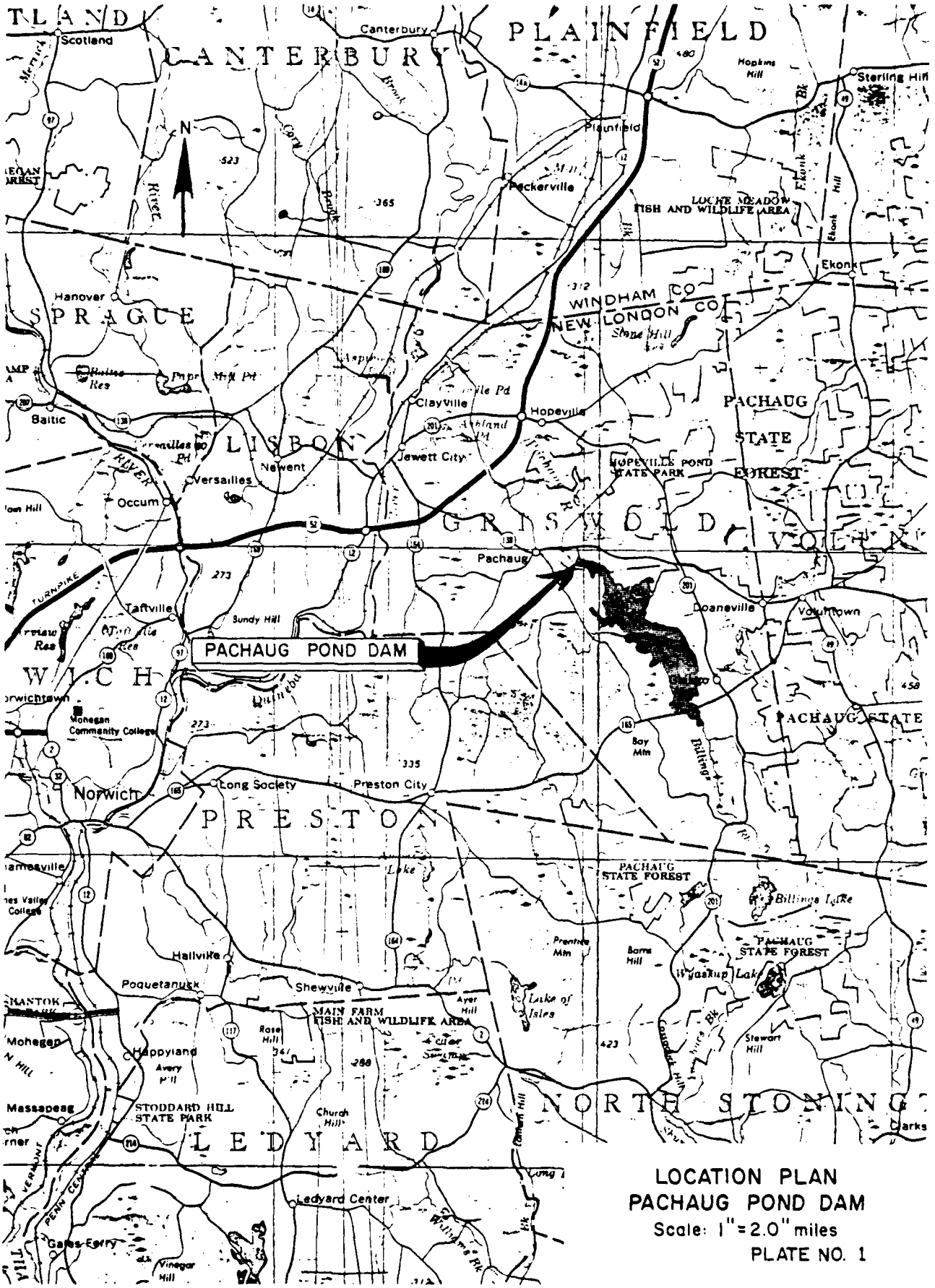
C-1 PACHAUG POND & DAM - LOOKING UPSTREAM



C-2 PACHAUG POND DAM - LOOKING NORTH



LOCATION PLAN
PACHAUG POND DAM
Scale: 1" = 2.0" miles
PLATE NO. 1

PHASE I INSPECTION REPORT

NAME OF DAM CT 00663

SECTION 1

PROJECT INFORMATION

1.1 GENERAL

a. Authority: Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. C-E Maguire, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to C-E Maguire, Inc. under a letter of 26 April, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0300 has been assigned by the Corps of Engineers for this work.

b. Purpose:

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which

threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT

a. Location: Pachaug Pond Dam is located in New London County, Connecticut, approximately one (1.0) mile south of Jewett City along Route 138. The dam impounds water from the Pachaug River which drains a 51.0 square mile watershed of rolling, flat terrain. Pachaug Pond is approximately 830 acres in size with an average depth of 18.0 feet. The dam is located at the extreme northern end of the impoundment (See Plate No. 1).

b. Description of Dam and Appurtenances: The dam is an earth embankment approximately 770.0 ft. in length with an average height of 17.0 ft. The top crest of the dam is 16.0 ft. wide and both upstream and downstream slopes approximate 2.0 H to 1.0 V and are grassed. The spillway is constructed

of cut stone masonry, 121.0 ft. wide with a straight approach channel and a broad, crested weir section (See Photos C-3, C-4). Training walls are grouted masonry and concrete with 6.0 ft. vertical faces. The outlet works consists of a straight, reinforced concrete sluiceway with a 36 in. W x 48 in. H sluice gate outlet operated by a two-speed manual control. The sluiceway, gatehouse and outlet are located adjacent to, and as part of, the easterly spillway training wall. The outlet discharges into a downstream reinforced concrete stilling basin.

c. Size Classification: The dam is classified as intermediate in size because impoundment at spillway crest elevation is 5982 Ac-Ft which exceeds 1000 Ac-Ft., the lower limit for the intermediate category.

d. Hazard Classification: This dam is classified as a high hazard structure because it is located where failure may cause serious damage to homes at Griswold and Jewett City, extensive damage to agricultural property, public utilities and Route 138 downstream.

e. Ownership (past and present): Pachaug Pond Dam

was constructed about 1888 by the Ashland Cotton Company and owned continuously by them until 1925. At that time, the company was purchased by the United Merchants and Manufacturers of New York and was known as the Ashland Corporation. This corporation was liquidated in 1951. The dam at present is owned by the State of Connecticut and managed by the Department of Environmental Protection - Division of Conservation and Preservation (Region No. 4 - District).

f. Operator: Mr. John Olsen
Director-Region No. 4
Div. of Conservation and Preservation

and: Mr. Stephan Merchant
Unit Manager
Corner Rt. 201 and Roode Road
Griswold, Connecticut 06351
(203)-376-2920

g. Purpose Of The Dam: General recreation and flood control.

h. Design and Construction History: Pachaug Dam was constructed circa 1888 by the Ashland Cotton Company to create Pachaug Pond as a storage reservoir for Hopeville Pond, located further downstream where the power generation equipment was installed. Just prior to 1951, when the Ashland Corporation was liquidated, repairs were concluded at the dam which included a new concrete gate canal,

gates, gatehouse, spiral concrete tailwater sluice and abutment. Seventeen years later, additional repairs to the Pachaug Pond Dam were completed by the C.F.I. Construction Company of Providence, Rhode Island, and involved installation of a new sluice gate and gatehouse, fencing, gratings and general clearing of brush and trees along the embankments. Stone fill was dumped in two localized, eroded areas on the upstream embankment slope in 1977 to protect the dam face against wave action and heavy recreational use.

i. Normal Operating Procedures: The water level in Pachaug Pond is generally not controlled, but rather the discharges are allowed to pass over the uncontrolled spillway year round. The outlet gate, as a rule, is tested annually for operations to ensure its use in an emergency and for repair situations.

1.3 PERTINENT DATA

a. Drainage Area: Pachaug River rises on the Eastern Connecticut - Rhode Island border at Beach Pond in heavily wooded, hilly country. From El. 296.0 at Beach Pond, the river meanders a distance of 14.0 miles to its confluence with the Quinebaug River,

near Jewett City at El. 100.0, a drop of about 200.0 ft. The watershed terrain is rolling and hilly with large surface storages in several natural and man-made swamps, lakes and reservoirs. The river flows are controlled to a great extent by a series of thirteen reservoirs with the Pachaug Dam facility located in the lower basin controlling a drainage area of 51 square miles. The storage potential located upstream has a signifcant potential for modifying the peak flows that occur at Pachaug Pond.

b. Discharge at Damsite: The U.S. Geologic Survey lists for gauge #01126950 - Pachaug River at Pachaug, Connecticut, the maximum discharge for the period of record (1961-1973) as 1,180 c.f.s. occurring on March 19, 1968. The calculated discharge for the flood of September 21, 1938 at the Pachaug Gauging Station was 1910 c.f.s. Additional discharge data is listed below:

1. Outlet works (conduits) size-36" W x 48" H at El. 146.0

2. Maximum known flood outflow at damsite estimated 1,910 c.f.s. (9/21/1938)

3. Overflow spillway capacity at maximum pool elevation - 6,400 c.f.s. at El. 167.0.

4. Gated outlet capacity at pool elevation with 3.0' x 4.0' gate - 213 c.f.s. at El. 161.0 and tailwater at El. 149.0

5. Gated outlet capacity at maximum pool elevation 261 cfs at 167.0 elevation with tail water at El. 149.0

6. Total discharge capacity at maximum pool elevation 6661 cfs at 167.0 elevation.

c. Elevation (ft. above NGVD)

1.	Top Dam	Elev. 167.0
2.	Maximum pool-design surcharge	6.0 with no free board
3.	Full flood control pool	Elev. 167.0 with no free board
4.	Recreation pool	Elev. 161.0
5.	Spillway crest	Elev. 161.0
6.	Upstream portal invert in lake structure	Elev. 148.0± Estimated
7.	Streambed at centerline of dam	Elev. 149.0±
8.	Maximum tailwater	Not computed

d. Reservoir (feet)

1.	Length of maximum pool	15,000 (scaled distance)
2.	Length of recreation pool	15,000 (scaled distance)
3.	Design surcharge	15,000 (scaled distance)

e. Storage (acre-feet)

1.	Recreation pool	5,982 at El. 161.0

2.	Flood control pool	4,980 at El. 167.0
3.	Design surcharge	4,980 at El. 167.0
4.	Top of dam	10,962 at El. 167.0

5. The flood control pool of 4980 Ac-Ft represents 1.83 inches of runoff from its drainage area of 51.0 sq. mi.

f. Reservoir Surface (acres)

1.	Top dam	830
2.	Maximum pool	830
3.	Flood-control pool	830
4.	Recreation pool	830
5.	Spillway crest	830

6. One foot of surcharge represents 0.305 inches of runoff from its drainage area of 51.0 sq. mi.

g. Dam

1.	Type	Earth embankment
2.	Length	770.0 ft. ±
3.	Height	17.0 ft. ±
4.	Top Width	16.0 ft. ±
5.	Side Slopes	1.75 H to 1.0 V (approximate)
6.	Zoning	unknown
7.	Impervious Core	unknown
8.	Cutoff	unknown
9.	Grout curtain	unknown
10.	Other	N/A

h. Spillway

1.	Type	Rect-uncontrolled straight
2.	Length of weir	121.0 ft.
3.	Crest elevation	El. 161.0 NGVD
4.	Gates	none
5.	U/S Channel	straight natural channel
6.	D/S Channel	natural irregular channel
7.	General	----

i. Regulating Outlets

1.	Invert	El. 147.0
2.	Size	36" W x 48" H
3.	Description	Rectangular Concrete Sluiceway
4.	Control Mechanism	Manually operated vertical slide gate
5.	Other	----

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The limited information available in the correspondence indicates that the embankment of this dam is constructed of earth, and that the spillway is constructed of grouted masonry. A cross section of the embankment is shown in Appendix B, where it may be seen that the downstream slope is

about 2.0 H : 1.0 V, although there are localized areas that are steeper. The portion of the upstream slope observable above water level is also sloped at about 2.0 H : 1.0 V, although it is locally wave-cut at the water level.

In plan view the dam consists of a 200.0 ft. long straight embankment on the left side, a 121.0 ft. long spillway section, and a 450.0 ft. long embankment on the right side. The right embankment is straight for a distance of 250.0 to 300.0 feet from the right spillway wall. It then gradually curves in a concave downstream direction until it meets the right abutment.

Both abutments apparently consist of soils natural to the site. No bedrock exposures were evident at the abutments at the time of inspection.

2.2 CONSTRUCTION

No information is available regarding the original construction. In 1967, the State of Connecticut reconstructed the gatehouse and other minor repair work. Plans and specifications were prepared by Benjamin H. Palmer, Engineer for the State Board of Fisheries and Game and work was begun in August, 1967, and completed in 1968. A drawing indicating this work is included in the Appendix.

2.3 OPERATION

No continuous record of operation at Pachaug Dam is available.

2.4 EVALUATION

a. Availability: Little information is available that would be helpful in the evaluation of the condition of the dam.

b. Adequacy: The available information is not adequate for evaluation of the condition of this dam. Additional data needed include: type and zonation of soils in the embankment; foundation conditions; side slopes at most critical cross sections; and, water levels within the dam.

c. Validity: Not applicable.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General: Pachaug Pond Dam appears to be generally in good condition with attention needed for only a few items. Trees and brush were cleared from the embankments and a mature growth of grass covered the structure and its slopes. The spillway and training walls with the exception of those items mentioned in other parts of this report were constructed of cut stone masonry with joints well aligned and pointed. The access road was gated and the gatehouse fenced and locked. An unusual

amount of wear and surface erosion on the earth embankment slopes has apparently occurred from overuse by the public.

b. Dam:

The embankments of this dam appear to have cross sections that are typical for dams of this vintage. Seepage was observed exiting from the downstream side of both the left and the right abutments. When observed, the seepage was found to be clear in all locations.

Based on the approximate observed cross section, the seepage appears to exit on the downstream side of the right embankment at a level higher than would be expected if this dam were homogeneous in cross section and permeability. The exit point at one location is shown on a cross-section sketch in Appendix B, and the seepage pond it creates may be seen in Photo C-11. The person standing on the downstream slope (See Photo C-12) is approximately at the top exit point of the seepage.
On the downstream slope, approximately 50.0 feet to the right of the spillway, there exists a substantial pile of 200 lb. to 1,000 lb. stones with seepage emanating from its base (See Photo C-13).

Correspondence dated September 18, 1975, indicates that a leak existed in the dam "just above and to the right of the outlet." No evidence of a leak existed at the time of the present inspection at this location; however, the pile of rocks mentioned above could represent repair of the previously noted leak.

Seepage exits from the left embankment from a point lower down on the downstream slope than was the case for the right embankment. This seepage collects in a low zone at the toe of the left embankment and is shown in Photo C-8.

Numerous stumps exist on both the upstream and downstream slopes of both the left and right embankments. Two examples are shown in Photo C-9 and Photo C-10. Photo C-9 shows a stump just above the upstream shoreline at the waterline on the right embankment, and Photo C-10 shows a stump just below water level on the downstream slope. The stumps are up to 3.5 feet in height, although most are 1.0 ft. to 2.0 ft. in height. Many stumps are severely rotted.

On the upstream slope of the dam, several low spots or swales were observed. Three are displayed in Photo C-5, which shows two in the foreground filled with rubble. The depression in the rear is an eroded spot on the slope. The origin of the above mentioned swales is not known.

Photos C-5 and C-6, show the upstream slope of the embankments, and demonstrate that no significant slope protection exists, except at the training walls. The slopes are wave cut at the water level.

No animal holes were found in either embankment. One 10 inch deep hole was found at Sta. 3+39 on the right embankment about midway down the downstream slope. This hole appears to have been formed by a rotted stump.

c. Appurtenant Structures

Structurally, the existing spillway and weir appear to be in good condition.

The west spillway training wall needs backfilling and repointing of the masonry.

At the east training wall, some settlement has occurred from surface erosion with seepage at the downstream toe near the base of the wall and needs investigation.

The gatehouse and outlet works recently repaired appear to be in good condition. Provision for removal of the sluice gate for repairs was not apparent.

d. Reservoir Area: Since the construction of Pachaug Dam, a series of upstream storage ponds and reservoirs have assisted in breaking peak runoff flows from the basin and averaging them out so that their impact at Pachaug is reduced. If it were not for this storage factor, the spillway capacity of the several dams in the Pachaug River would be far too small to pass floods. The safety of this chain of 13 dams is particularly interdependent. The failure of almost any one has the potential to lead to the overtopping and failure of downstream structures. It is, therefore, imperative that they all be kept in excellent repair.

e. Downstream Channel: The downstream channel is natural and irregular in alignment with trees and

brush overhanging the channel. Because downstream flows pass under Rt. 138 through a culvert, it is essential that all potential clogging by debris be eliminated.

3.2 EVALUATION

Visual observations made during the course of the inspection indicate several detrimental items that require attention. Several of the deficiencies observed and discussed above require action and should receive attention before further deterioration develops a hazardous condition. Recommended measures are discussed in Section 7.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

1. Normal Operating Procedures: The water level for Pachaug Pond is generally uncontrolled. Normal operating procedure allows all discharges to pass over the uncontrolled spillway with the outlet works closed. The sluice gate for the outlet is tested usually once annually to insure that it remains operable. As a rule, the outlet gate has been opened only for maintenance and repair work.
2. Emergency Operating Procedures: No formal contingency plan for emergency operation or standby exists. The gate stand handle is kept in the gate

tenders residence approximately 1-1/2 miles away with the keys to the locked gatehouse because of vandalism at the dam site. It is assumed that in an emergency situation some direction will be given to the region 4 headquarters (i.e., the gate tender) for regulation of the sluice gate by the Department of Environmental Management in Hartford.

4.2 Maintenance of the Dam: Maintenance of the facilities has occurred intermittently by the State of Connecticut through the regional personnel of the Department of Environmental Management. No annual, or regular, program exists.

4.3 Maintenance of Operating Facilities: A program for testing the operation of the sluice gate annually is in effect by the regional staff of the Department of Environmental Management.

4.4 Description Of Any Warning System In Effect: Unknown.

4.5 Evaluation: Pachaug Pond Dam lacks proper maintenance. Its operation, coordinated with other dams in the Pachaug River system, could potentially attenuate flooding.

SECTION 5 - HYDRAULIC/HYDROLOGIC ANALYSIS

5.1 Evaluation of Features

a. Design Data: No existing design data was obtained. U.S. Coast and Geodetic Survey maps were utilized to develop the hydrologic parameters such as: drainage area; water surface area; runoff and watershed characteristics; downstream channel cross-sections. An Elevation-Area-Storage curve for Pachaug Pond was not available. Surcharge storage was determined assuming the lake surface area at spillway crest is constant above that elevation. For available information and drawings for the damsite, see Appendix B. Design data developed for this investigation is listed below:

INFLOW, OUTFLOW AND SURCHARGE DATA

FREQUENCY IN YEARS	24-HOUR TOTAL RAINFALL IN INCHES	24-HOUR* EFFECTIVE RAINFALL IN INCHES	MAXIMUM INFLOW IN C.F.S.	MAXIMUM** OUTFLOW IN C.F.S.	SURCHARGE STORAGE IN FEET	SURCHARGE STORAGE ELEVATION
10	5.0	2.6	4200	3012	3.63	164.63
50	6.5	4.1	6500	6450	6.1	167.1
100	7.0	4.6	7500	7470	6.60	167.6
1/2 MPF	11.9	9.5	12750	12300	7.9	168.9
TEST FLOOD = M.P.F.	21.4	19.0	25500	24800	10.0	171.0

*Infiltration assumed as 0.1"/hour

**Lake assumed initially full at spillway crest elevation 161.0 .
(Top of dam = 167.0 .)

NOTES:

1. Q_{10}; Q_{50}; Q_{100}; inflow discharges computed by approximate methodology of Soil Conservation Service.
2. 1/2 MPF and "test flood" computation based on COE instructions and guidelines.
3. Maximum capacity of spillway without overtopping the top of the dam elevation 167.0 is equal to 6400 C.F.S.
4. All discharges indicated are dependent upon the continued integrity of upstream storage reservoirs.
5. Surcharge storage is allowed to overtop the dam when exceeding the spillway capacity.

b. Experience Data

Spillway

Maximum Recorded outflow - 1180 cfs 3/19/68

Maximum known flood outflow - 1910 cfs 9/21/38 (est.)

No records are available for the storm of 1955

Outlet Works

Maximum discharge @ El.161.0 - 213 cfs

Outlet works were replaced by the State of Connecticut in 1967-68.

c. Visual Observations

1. Consideration should be given to the placement of downstream stone protection at the spillway as an effective energy dissipator.
2. Repair to both training walls is needed and should include backfilling, grouting and repointing.
3. It is essential to control trespass on the dam embankment and eliminate excessive wear and erosion.
4. Freeboard allowance is lacking for the spillway design flood as well as lesser storm events. Storm surge and wave ride-up causing

overtopping are a distinct possibility for the combination of moderate intensity storms with accompanying high velocity winds.

5. Calibration of the gate control with the impoundment should be accomplished and the establishment of a daily water surface level record.

d. Overtopping Potential

The spillway capacity is inadequately sized to meet the screening criteria as established by the Corps of Engineers. Analysis of the 100 year storm event indicates that Pachaug Pond water surface levels would rise to within 0.60 ft. of the crest of the existing dam and that any wind generated wave action or ride-up would have the potential to overtop the embankment and lead to failure. As discussed earlier in this report, the spillway capacity of this dam is directly a function of the condition of the upstream storages and should be studied in detail as a system of impoundments.

With water surface levels at spillway crest elevation (161.0) the outlet capacity is 213.0 cfs. At that level, the reservoir capacity is equal to 830 Ac-Ft. for one foot of depth. It would require 46

hours approximately to draw down the water level the first one foot of depth using the outlet works only in an emergency situation.

The maximum spillway discharge capacity is equal to 6400 c.f.s. which represents 25.7% of the "Test Flood" outflow discharge of 24,800 c.f.s. This "Test Flood" discharge would overtop the dam by 4.0 ft. See Appendix D for the Spillway Rating Curve.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There were no indications of structural instability based on visual observations. No misalignment, sloughing of slopes, settlement, or movement of structures was observed that would be caused by structural instability.

b. Design and Construction Data

There is no information available about the properties of the soil in the embankment, the foundations or the abutments, which would be needed to help evaluate structural stability.

c. Operating Records

There are no operating records available that pro-

vide any indications regarding the stability of the dam.

d. Post-Construction Changes

Subsequent to construction, trees were allowed to grow on the slopes of the dam. Those trees were subsequently cut down, but the roots were not removed. The roots are now decaying in place and may cause eventual failure by internal erosion (piping).

e. Seismic Stability

The dam is in seismic zone 1 and hence, does not have to be evaluated for seismic stability according to the Recommended Guidelines.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition: Examination of available documents and visual inspection of the Pachaug Pond Dam and appurtenant structures indicate the facility is in fair to good condition and functioning satisfactorily. However, review of the limited data and the visual inspection revealed four areas of concern with respect to the overall long term condition of the dam.

1. Seepage was observed emerging from the downstream slope of the dam embankment at levels higher than usual for a dam of this type. High water levels in the pond could lead to internal erosion and eventual failure, because the seepage is not controlled. The presence of decaying roots on both the upstream and downstream sides increases the probability of failure by internal erosion. There is no evidence of any wing wall or cutoff from the spillway walls into the embankment. Internal erosion could occur at this location, although no leakage was observed at the time of inspection.
2. The upstream face of the dam is not protected by rip rap against wave action except in a few specific locations where erosion has occurred in the past. Lack of such protection could lead to washout of the embankments under a severe combination of storm and waves.
3. The maximum spillway discharge capacity is equal to 6400 c.f.s. which represents 25.7% of the "Test Flood" outflow discharge of

24,800 c.f.s. This "Test Flood" will overtop the dam by 4.0 feet.

4. The dam has an inadequate freeboard allowance which could result in overtopping of the dam from lesser storm events under certain wind speed and directional conditions.

b. Adequacy of Information

The information available is such that the assessment of the condition of the dam must be based primarily on the visual inspection and the past operational performance of the structure.

c. Urgency

The recommendations and remedial measures outlined below should be implemented by the Owner within a two year period.

d. Necessity for Additional Investigations

Additional investigations to further assess the adequacy of the dam and its appurtenances are necessary. Sufficient engineering data must be obtained to implement the recommendations listed below.

7.2 RECOMMENDATIONS

a. Facilities: In view of the concerns for the long term condition of Pachaug Pond Dam, and the lack of engineering backup data, it is recommended that the following measures be undertaken by the Owner.

1. Obtain the services of an engineer experienced in the design of dams to conduct the investigation.
2. Implement a limited subsurface exploration and testing program to determine the composition of the earth embankment.
3. Design a seepage monitoring and collection system to obtain sufficient data to effectively monitor and control the flows.
4. Include provisions to remove the detrimental effects of rotting roots on both the upstream and downstream slopes of the embankment.
5. Provide slope protection for the upstream face of the dam.
6. Analyze the freeboard allowance with respect to the Spillway Test Flood criteria and institute corrective measures to provide this allowance. Alternative solutions that may be considered are: raising the embankment; lowering the pool to increase flood control storage; enlarging the outlet works to increase the discharges; developing an emergency spillway or providing additional upstream storage. This analysis should include a total basin study to determine the impact of upstream dam failures and stor-

ages at Pachaug Pond because of the large contributing drainage area.

7.3 REMEDIAL MEASURES

a. Alternatives: Alternatives to the recommendations listed above would be to lower the water levels in Pachaug Pond at the approach of high intensity storms, to increase capacity for flood control or to investigate increasing upstream storage capacity at other facilities to relieve the conditions at Pachaug.

b. Operations and Maintenance Procedures: While the dam is generally in fair to good condition, it is considered important that the following items be attended to as early as practical:

1. Develop and initiate a program of continuing maintenance of the dam and its appurtenant structures including the control of vegetation on the dam.

2. Institute a program of periodic inspections of the dam and its appurtenances with special attention given to monitoring areas of emerging seepage for changes in volume of flow and presence of any suspended solids.

3. Prepare an emergency action plan to prevent or minimize the impact of failure, listing

the expedient action to be taken and authorities to be contacted.

4. Because present freeboard allowances are marginal and slope protection lacking, implement a short term program of a round the clock surveillance at the dam during periods of high intensity storms until improvements have been made at the site as outlined in 7.2a.6.

5. Consider restricting the public's use of the facility to eliminate further surface erosion from trespass.

APPENDIX A

INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Pachaug Pond Dam DATE 22 May 1978

TIME 0950 - 1600

WEATHER Clear 70°F in sun
Wind 10 MPH

W.S.ELEV. _____ U.S. _____ D.S.

PARTY :

1. R. Long CEI
2. S. Poulos GEI
3. S. Khanna CEI
4. A. Reed CEI
5. R. Brown CEI
6. V. Galgowski Conn. DEP
7. S. Merchant Conn. DEP
8. F. Gulliani CEI
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT PACHAUG POND DAM DATE 22 MAY 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	El.161 NGVD(From U.S.G.S. Quad Sheet)
Current Pool Elevation	El. 161.2 ± (Estimated)
Maximum Impoundment to Date	5982 Ac-Ft. (Estimated)
Surface Cracks	None Observed
Pavement Condition	N/A - Gravel Road
Movement or Settlement of Crest	None observed.Too irregular to ascertain
Lateral Movement	None Observed.Too irregular to ascertain
Vertical Alignment Horizontal Alignment	No displacement observed. Several small depressions on upstream face. Surface quite irregular.
Condition at Abutment and at Concrete Structures	Condition good at both abutment contacts. Upstream slope to right of right wall of spillway channel is backfilled with stone rubble, possibly to stop erosion.
Indications of Movement of Structural Items on Slopes	One slab of gneiss (cutstone) on crest tilled down, probably due to erosion along path that is parallel to right wall of spillway on downstream slope.
Trespassing on Slopes	Yes - causing some surface erosion Paths adjacent to and near left and right walls of spillway are eroding.Free access
Sloughing or Erosion of Slopes or Abutments	Yes - On upstream face over a distance of 200 ft. to right of spillway. Swales are 1 to 1.5 ft. deep, 3 to 4 ft. wide and 6 to 8 ft. up and down slope, above water level. Two nearest spillway filled with stone rubble.

PERIODIC INSPECTION CHECK LIST

PROJECT PACHAUG POND DAM DATE 22 MAY 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT (Continued)	
Rock Slope Protection - Riprap Failures	No Rock Slope Protection Localized slough areas filled with stone rubble.
Unusual Movement or Cracking at or near Toes	None observed
Unusual Embankment or Downstream Seepage	Seepage observed at several locations on right and left embankments
Piping or Boils	None Observed
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None
Vegetation	Several old stumps on up and down stream face. Rotting in place.

PERIODIC INSPECTION CHECK LIST

PROJECT Pachaug Pond Dam DATE 22 May 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	N/A - No dike

PERIODIC INSPECTION CHECK LIST

PROJECT PACHAUG POND DAM DATE 22 MAY 1973

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	a. Depth of water precluded proper inspection of these items.
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	Satisfactory
Stop Logs and Slots	Used in concrete sluceway to reduce pressure on gate. These items were underwater and therefore unobservable.
Screens (Trash Racks)	Unobstructed

PERIODIC INSPECTION CHECK LIST

PROJECT PACHAUG POND DAM DATE 22 MAY 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - Gatehouse	
a. Concrete and Structural	
General Condition	Good
Concition of Joints	Good
Spalling	None Observed
Visible Reinforcing	None Observed
Rusting or Staining of Concrete	None Observed
Any Seepage or Efflorescence	None Observed
Joint Alignment	Good
Unusual Seepage or Leaks in Gate Chamber	Gate Well unobservable
Cracks	None Observed
Rusting or Corrosion of Steel	None Observed
b. Mechanical and Electrical	
Air Vents	None
Float Wells	None
Crane Hoist	None (no visible means to remove gate for repairs)
Elevator	N/A
Hydraulic System	Manual operated gate. Handle kept at gate keeper's house (1½ mi. away)
Service Gates	None
Emergency Gates	None
Lightning Protection System Emergency Power System Wiring and Lighting Syster	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT Pachaus Pond Dam DATE 22 May 73

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of concrete Rust or Staining on Concrete Spalling Erosion or Cavitation Cracking Alignment of Monoliths Alignment of Joints Numbering of Monoliths	Outlet discharges in cistern type structure below water level. Rectangular concrete sluiceway 3.0 ft. by 4.0 ft. not observable.

PERIODIC INSPECTION CHECK LIST

PROJECT Pachaug Pond Dam DATE 22 May 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Sluice gate discharges below water level into stilling basin. Gate is 36 inches wide by 48 inches high.
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	Concrete appears to be in good condition where observable above water level.

PERIODIC INSPECTION CHECK LIST

PROJECT Pachaug Pond Dam DATE 22 May 78

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Straight, rectangular, unobstructed
General Condition	Fair to good
Loose Rock Everhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Unobstructed, appears to be covered with gravel and cobbles.
b. Weir	
General Condition	Good - grouted stone masonry
Rust or Staining	None observed
Spalling	None observed
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	None observed
Drain Holes	None observed
b'. Training Walls	
General Condition	Grouted stone masonry surface good, some settlement of stones on right training wall observed, none dislodged.
Rust or Staining	None observed
Spalling	None observed
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	None observed
Drain Holes	None observed but grout is missing in a few locations from which drainage may occur

PERIODIC INSPECTION CHECK LIST

PROJECT Pachaug Pond Dam DATE 22 May 78

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Yes
Floor of Channel	Natural streambed
Other Obstructions	Brush and trees

PERIODIC INSPECTION CHECK LIST

PROJECT Pachaug Pond Dam DATE 22 May 1973

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	N/A
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Concition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Concition of Seat & Backwall	

APPENDIX B

1. Listing of Locations for Available Correspondence Data

2. Copies of Past Inspection Reports

3. Plans, Sections, Details

APPENDIX B-1

1. Victor J. Galgowski, Dam Safety Engineer
   Department of Environmental Protection
   State Office Building
   165 Capital Avenue
   Hartford, Connecticut 06115

2. Cole Wilde, Chief
   Fish and Water Life Unit
   Department of Environmental Protection
   State Office Building
   165 Capital Avenue
   Hartford, Connecticut 06115

APPENDIX B-2

1.	9/18/75	-	Memo to John Olsen, D.E.P. from Joseph Piza, D.E.P. - Re: leak in Pachaug Dam
2.	2/4/75	-	Photos
3.	7/12/72	-	Inventory data; data sheet
4.	9/30/66	-	Inspection by Chandler & Palmer
5.	8/23/65	-	Memo to Cole Wilde from Joseph Piza Re: leaks in dike
6.	8/25/54	-	Lake and Pond Survey by Conn. State Board of Fisheries and Game
7.	10/7/52	-	Letter to William Wise from Benjamin Palmer - Re: Inspection of dams on Pachaug River
8.	(no date)	-	State Board of Supervision of Dams - Report and Recommendations on Pachaug Pond
9.	11/14/45	-	Letter to Sanford Wadhams from Linwood Mort - Re: Report on Pachaug River with enclosures

interdepartment message

STO-200 REV. 11/73 (Stock No. 6938-050-011)

SAVE TIME: *Handwritten messages are acceptable.*
Use carbon if you really need a copy. If typewritten, ignore faint line:

	NAME	TITLE	DATE
To	John Olsen	Regional Director	9/18/75
	AGENCY	ADDRESS	
	D.E.P.	Region IV	
	NAME	TITLE	TELEPHONE
From	Joseph Piza	Fisheries Biologist	376-2513
	AGENCY	ADDRESS	
	D.E.P.	Region IV	

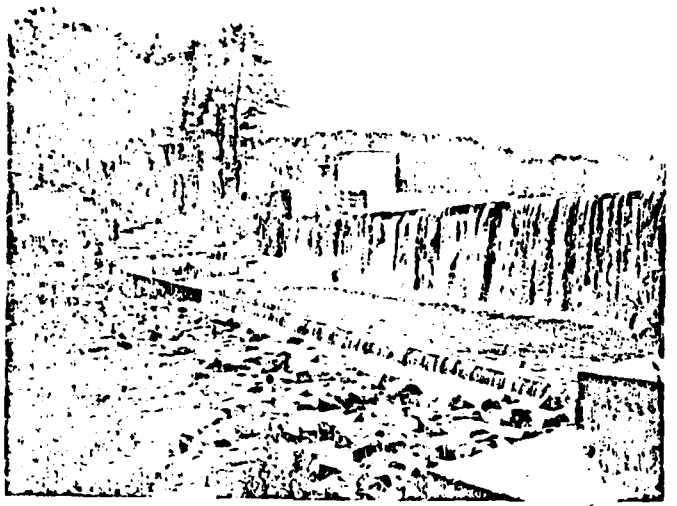
SUBJECT

Leak - Pachaug Dam

On Sept. 18, 1975 while checking the drawdown of Pachaug Pond, Steve Merchant and I observed a small leak in the dam. The leak is just above and to the right of the outlet. While of minor nature at present, it should be checked and possibly repaired if and when the pond is drained down six feet.

Joseph Piza

SAVE TIME: *If convenient, handwrite reply to sender on this same sheet.*



No date (2/9/75?)

2/9/75

2/9/75

2/9/75

REGION A

TOWNSHIP Griswold NAME OF IMPOUNDMENT Pachaug Pond

NEAREST STREET LOCATION Bethel Road

U.S.G.S. QUAD. SHOWING LOCATION OF DAM Jewett City

NAME OF STREAM Pachaug River

POND USED FOR Recreation

TYPE OF SPILLWAY CONSTRUCTION Stone

TYPE OF DIKE CONSTRUCTION Earth

TYPE OF DRAWDOWN CONSTRUCTION Gate valve

OPERABLE: YES x NO ____ EQUIPMENT NEEDED TO OPERATE Gate valve wheel

Obtain key to open gate house at Pachaug RangerHHeadquarters, Voluntown

EQUIPMENT LOCATED WHERE Pachaug Ranger Headquarters, Voluntown

KEYS REQUIRED: YES x NO ____ LOCATION OF KEYS: ENTRANCE Pachaug Ranger Headqu-

Voluntown CONTROLS

PERSON TO CONTACT John Olsen

TELEPHONE # OFFICE 376-2513 HOME 376-2370

DOWNSTREAM CONDITIONS THAT COULD RESTRAIN OPERATION OF GATES None

POTENTIAL BENEFIT OF LOWERING DURING FLOOD WATCH None

DESCRIBE DAMAGE THAT WOULD RESULT FROM DAM FAILURE Washout dams; Hopeville and Ashland Ponds. Damage Jewett City homes and factories.

7/12/72
jb

No. 19

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

II-9

Inventoried By _____

Date _____

Name of Dam or Pond FACHAUG POND

Code No. 7147 533 Q 66 FG 66

Nearest Street Location _____

Town GRISWOLD Long 71-57-16

U.S.G.S. Quad. Jewett City Lat 41-36-48

Name of Stream FACHAUG River

Owner STATE OF CONN. D.E.P. 9/4/73

Address _____

Pond Used For _____

Dimensions of Pond: Width _____ Length _____ Area 830.9 A

Total Length of Dam 600 Length of Spillway 140'

Location of Spillway Center

Height of Pond Above Stream Bed 12

Height of Embankment Above Spillway 6'

Type of Spillway Construction Vert Grouted Stone into Stilling basin

Type of Dike Construction Fill

Downstream Conditions _____

Summary of File Data "Inst Condition" Palmer Oct 7/52

Remarks Struct # 18 hydro # 11

normal cap 5982 max cap 7977

Would Failure Cause Damage? Probably Class B

5-17-77 Sm good condition U J L

→ 8/8/73

J.O. Elmen? Dam appears in good cond Some growth at joints could be removed

sluice opening 3.5' x 5' condition of gate could not be seen as conc Block House locked

Dike section in good condition

(Back of page 1 (IV-9)

CHANDLER & PALMER
CIVIL ENGINEERS
114-116 THAYER BUILDING
TELEPHONE 887-5540

BENJAMIN H. PALMER
SHEPARD B. PALMER

DAMS
WATER SUPPLIES
SEWERAGE
APPRAISALS
REPORTS
SURVEYS

MEMBERS AMERICAN AND CONNECTICUT SOCIETIES
OF CIVIL ENGINEERS

NORWICH. CONN.

September 30, 1966

Re: Pachaug Pond Dam

State of Connecticut
Board of Fisheries & Game
State Office Building
Hartford, Connecticut

Attention: Mr. Theodore B. Bampton, Director

Dear Sir:-

In connection with the work at Pachaug Pond Dam I report as follows.

Pachaug Pond Dam is located North 41° 35' and West 71° 56' as shown on the Jewett City sheet of U. S. Geological survey.

The drainage area is 51 square miles. Using the formula $Qm = 55A^{0.8}$ then Qm = 1276 c.f.s. This is the average annual flood to be expected. For a flood to be expected once in 100 years this is multiplied by 3.7 for a total flood flow of 4721 c.f.s.

The existing spillway for the dam is 121 feet long and abutment walls are 6' high. A depth of 5' 2" of water over the dam would give ~~4721 c.f.s.~~

The dam is a stone masonry dam in good condition. There are numerous ponds upstream that would tend to slow down a flood flow. This dam has gone through the 1938 and 1955 floods without damage and in my opinion is adequate for any reasonable flow.

The work which we propose to do is the installation of a new gate and will not in any way affect or lessen the spillway capacity.

Very truly yours,

B H Palmer

BHP/ew

INTERDEPARTMENT MAIL

DATE: Aug. 23, 1938

TO: [illegible], Chief, Fish Div. — DEPARTMENT: Fish & Game

FROM: Joseph Ziza, Dist. Fishery Biologist — DEPARTMENT: " "

SUBJECT: Pachaug Pond Dam-Leaks In Dike

While surveying the proposed Pachaug Pond Launching Area I have found at least three large leaks under the dirt dike which have created a swamp under the dike. The leaks are caused by the large number of trees growing on the dike.

The leaks under the dam create a problem as far as the parking area for the launching area is concerned. In order to solve the trouble the trees should be cut and the leaks stopped on the pond side of the dike before we do any filling for the parking area.

CC: Harding Joray

CONN. STATE BOARD OF FISHERIES AND GAME

LAKE AND POND SURVEY

Initial completed work:
Chemistry .... Mapping ....
Seining .... Netting ....
Growth Curves ....
Summarization ....
Recommendations ....

Name Pachaug Pond Code No. .... Date 8-25-54

County New London Township Griswold Elevation 161

Area 830.9 Method of Determination .... Volume 219,104,283 ft³ / 500,524,457 gal. Drainage Area 30 sq. mi.

Sounded: no (yes) Date 23 Aug 54 Max. depth 17 Mean depth 6.1

Origin: natural (artificial) Shape of basin: ravine kettle (saucer) rock basin flooded swamp

Tributary to Pachaug R. River system Thames

Dam: height 12' type Stone age ? condition Good Fishways: (absent) present needed

Spillways: depth of flow 2" width of flow 150'

Pond can be drawn: (completely) partially not at all .... feet

Fluctuation of water level none at present feet Cause ....

Character of drainage area: agriculture ......% hilly 100% mountainous ......% lowland ......% wooded 100% swamp ......%

Types of surrounding agriculture: ....

Inlet streams (take information at point where conditions are average):

Name	Av. Depth	Av. Width	Temp.	Speed of flow*	Diversion possibility	Other ponds present
Pachaug R.	18"	30'	72	very slow		yes
Billings Br.						yes
Carter Br.						

* slow, moderate, swift, torrential

Inlet streams furnishing important spawning or forage areas: none

Bottom springs: numerous (few) absent Other sources ....

Area under 3 ft. 20% over 10 ft. 15%

Shoal areas (under 3'): extensive (intermediate) rare

Bottom type: sand ......% gravel and rubble ......% mud ......%
sand and gravel 50% coarse rubble and boulders ......% clay ......%
broken ledge and ledge ......% swampy ooze 50%

Area in submerged weeds 50% Species Potamogeton, Utricularia, Ranunculus

Area in emergent weeds 30% Species Nymphaea, water shield, lake sedge, Button bush, Nuphar

Siltation: negligible moderate large nearly complete

F-19 50001 7-54

STATE OF CONNECTICUT

STATE BOARD OF SUPERVISION OF DAMS

ROOM 317. STATE OFFICE BUILDING. HARTFORD

Created by Chapter 290 of the Public Acts of 1939 to supervise dams, dikes, reservoirs and other similar structures. "All such structures, with their appurtenances, without exception and without further definition or enumeration herein, which, by breaking away or otherwise, might endanger life or property, shall be subject to the jurisdiction conferred by this act."

PLEASE REPLY TO

October 7, 1952

Mr. William S. Wise
Chairman, State Water Commission
State Office Building
Hartford, Connecticut

Dear Sir:-

At your request I have within the past week examined several dams on the Pachaug River and report as follows:

(5) Beach Pond

This dam is also in the Town of Voluntown on the Pachaug River about 1/2 mile North of Route #165. This is a long earth dam about 400 feet long and 15 feet high. The spillway is 20 feet wide with 4½ foot abutments. This pond is used for storage only and there is no power installation. The pond was down about 4 feet from full pond when I was there. Water is drawn off through a gate as required. Here again the dam and spillway appeared in good condition.

The footbridge over the spillway is made of wood, is in poor condition and needs to be replaced. The flashboards are in poor shape. I could not see much of the gate but I believe it to be in fair condition.

As a concluding statement I would say that in general the masonry and embankments of all dams are in good condition and will require little maintenance. The small amount of timber, such as gates, bridges, flashboards etc. should in general be renewed fairly soon.

I hope that this report will be of help to you.

Very truly yours,

Benjamin H Palmer

Member, State Board of Supervision of Dams

BHP/EW

7/7.753.3Q6/46.6

STATE BOARD OF SUBDIVISION OF LANDS
CONNECTICUT

1. Name: Pachaug Dam--Built about 1808
2. Owner: United Merchants & Manufacturers
Ashland Plant--Jewett City, Conn.
3. Town: Griswold
4. Stream: Pachaug River
5. Pond: Pachaug Pond
6. Location: 1 Mile South of Route 138--Jewett City to Voluntown.
7. Watershed and Drainage Area: 49.5
8. Size of Pond: 750
9. Type of Construction: Wet rubble masonry
Ashlar stone and Earth Dam--Stone Spillway
Concrete race, gates, wash basin
10. Freeboard: 8'
11. Overall Length: (Height above Stream) 600'
12. Length of Spillway: 100'
13. Height of Spillway: 15'
14. Height of Non-Overflow Section: 22'
15. Depth of Spillway: 8'
16. Type of Gate:
17. Size of Gate:
18. Draw off Pipe: None
19. Flashboards: None
20. Max. Discharge sec. ft.: 8878
21. Spillway Capacity C.F.S.: 5800
22. Gate Capacity sec. ft.:
23. Draw off Pipe Capacity sec. ft.:
24. Max. Discharge C.F.S./s. m.: 48

PACHAUG DAM

This dam was built about 1888 by the Ashland Cotton Company to create Pachaug Pond as a storage reservoir to insure a reserve supply for Hopeville Pond further downstream at the Dam of which a power plant is located. The Ashland Cotton company was purchased about 1925 by United Merchants & Manufacturers of New York, becoming a subsidiary of said company and known as the Ashland Corporation. The ownership of the dam and flowage and riparian rights are now vested in the present owners. The stone spillway and earth fill sections of the dam are of gravity type and stable in section and at the time of inspection in August revealed no leaks. However, the pond was low with no water flowing over the spillway and the static head was comparitively small.

This is a long dam; the earth section on the east measuring 300' and that on the west measuring 900'. To some extent they have been protected with stone paving to prevent erosion. A considerable growth of trees has been allowed to grow on the earth sections, some of particularly large size on the east end. I look upon this as undesirable as they are a source of potential trouble and can weaken the earthwork.

The storage capacity of this pond is great and acts in a manner to spread out and minimize severe floods, and helps to protect downstream works.

The spillway capacity is adequate for peak flows and allows a good safety margin.

Inspection revealed that sometime within the last couple of years, a new concrete gate canal, gates, gate house, spiral concrete gate tail sluice, abutment repairs, and repointing have taken place. This work was done without the knowledge of the Board.

This dam is the most important cog in the control of floods in the Pachaug River basin and therefore its safety is most important to all downstream structures. U.S. Route 138 crosses the Pachaug River about ¼ of a mile downstream and the area below becomes more and more heavily settled until the confluence with the Quinebaug in the heavily settled Borough of Jewett City. If this dam should go out, the large body of water impounded by it which is one of the largest in the state, could cause a major catastrophe. It seems important that all data relating to this structure be on file in the office of the Board.

RECOMMENDATION

That the Chairman of the Board write to the United Merchants & Manufacturers Corporation, Ashland Plant, Jewett City, Conn. to the following effect. That an inspection of this dam reveals that construction and repair work has been done on the gates, spillway, and appurtenances without the approval of the Board of Supervision of Dams or in accordance with State law governing work on such structures. (Enclose Copy of Booklet containing Act and explanatory data).

That it is assumed that though this work may have been prosecuted in ignorance of the law, the Board desires full information as to the nature and type of work accomplished, together with engineering data and sketches for review so that the Board may pass upon the safety of said construction.

Further, it is the opinion of the Board that the growth of trees on the earth sections of the dam embankment constitute a possible hazard to the safety of said embankment and earth fill and the owner is hereby ordered to remove same.

It is suggested that, if the owner so desires, a member of the Board be made available to go over the site with the owners representative and indicate the growth considered objectionable.

LOCATION MAP - REFERENCE # - KEY TABLE

1. BEACH POND DAM
2. LYNCHS DAM
3. FORGE POND DAM
3A. COLLINS POND DAM
4. BEACHDALE DAM
5. YELLOW MILL DAM
6. SAWMILL POND DAM
7. SHELDON'S POND DAM
8. SIGNAL HILL DAM
9. GLASCO DAM
10. PACHAUG DAM
11. HOPEVILLE DAM
12. ASHLAND DAM
13. SLATER DAM

STATE BOARD OF SUPERVISION OF DAMS

ROOM 317, STATE OFFICE BUILDING, HARTFORD

Created by Chapter 290 of the Public Acts of 1939 to supervise dams, dikes, reservoirs and other similar structures. "All such structures, with their appurtenances, without exception and without further definition or enumeration herein, which, by breaking away or otherwise, might endanger life or property, shall be subject to the jurisdiction conferred by this act."

PLEASE REPLY TO

November 14, 1945

General Sanford H. Wadhams, Chairman
State Board of Supervision of Dams
Room 317, State Office Building
Hartford, Connecticut

Dear General Wadhams:

Under date of January 13, 1944, you wrote me concerning two dams owned by the Glasgo Finishing Company, which were repaired by them without any reference to the board and asked that I investigate the matter. Subsequently, I proceeded to do this, inspected the sites, and held a conference with Mr. Revell, superintendent of the Glasgo Finishing Company.

My investigation revealed that there were not only two dams they had repaired, but also others that they had reconstructed, one of which, located at Collings Pond, had been entirely rebuilt. In tracing down the dams controlled by the Glasgo Finishing Company, I discovered other dams on the Pachaug River which had been repaired by owners other than the Glasgo Company, the character of which would bring them under our jurisdiction. In order to properly study the Glasgo dams, it would be necessary to take these other dams into consideration. After consultation with another member of the Board, Clarence Blair, who was familiar with the territory, and has since passed away, we decided that the best method of approach would be to make a complete analysis of the Pachaug River watershed, examining all dams on the Pachaug River together with the one at Collings Pond on Denison Brook. I consequently made such recommendation to you and with your approval, have proceeded with same.

The Pachaug River rises at Beach Pond, located in the towns of Voluntown, Conn. and Exeter, R.I., and flows thence in a Westerly direction through Voluntown and Griswold, Conn. until its confluence with the Quinebaug River just below Jewett

City and a slight distance downstream from the large Concrete highway bridge on Route 12 across the Quinebaug River.

The situation along the valley of the Pachaug, with its numerous crossing highways, farms, and villages, and the danger to life and limb, and public and private property, should one of the larger of these dams go out, or the danger of progressive failure should one of the larger upstream impounding dams go out, is such as to bring all dams on this stream under the jurisdiction of the board.

You will find enclosed a report divided into several parts as follows:

1. Geological survey maps on which is shown the Pachaug River and tributary streams and on which I have indicated the location of dams by Key number and an outline of the Watershed of each specific contributing area.

2. Hydrologic discussion of the Pachaug River Watershed in general.

3. Key to dams.

4. Descriptive data, discussion, and conclusions concerning individual dams by Key.

5. Recommendations.

6. Summation.

Notes, detailed analyses, and calculations are on file in my office and are available for reference when desired by your office or by members of the Board of Supervision of Dams.

As of this writing--detailed data and plans covering the construction of new gates at Glasgo Dam have not been received from F.V. Steutemann, Chief Engineer of the Glasgo Co. Same has been promised and I am again writing to Mr. Steutemann to remind him that we are still waiting for this information.

I am sending this report on to you, however, without a full report on this one dam, but as soon as final plans are received, I will correlate and forward them to you so that your file will be complete.

Two dams on the Pachaug River, located lowest downstream and nearest the mouth of the river, have not been inspected or treated in this report.

The first of these, Ashland Dam, lies next in line downstream from Hopeville Dam and is in the center of the borough of Jewett City. I understand that some work was done around this structure a while back. The second of these, Slater Dam, lies just above the highway bridge on Route 138 over the Pachaug at the lower end of the borough. I understand that its condition is good. The Highway Department has just let a contract for the construction of a new 100' span bridge to replace the old at this site. Both Ashland and Slater are large dams and though inspection of them is not urgent nor not perhaps as necessary as in the case of the other Pachaug Dams, it is suggested that they be looked over a little later when construction of the new bridge at Slater Dam is started to ascertain whether in any way the dam will be disturbed or affected.

Very truly yours,

Linwood G. Mort

Linwood G. Mort
Member, State Board of Supervision
of Dams.

LGM:JS
Enc.

STATE BOARD OF SUPERVISION OF DAMS
CONNECTICUT

SUMMATION

From the data and information in this report and reference to the keyed Geological Survey map, one obtains a picture of typical New England use of water for power and processing. For almost a century prior to 1900, this river was dotted with small dams to give water power for small home owned industries. As the general industrial trend toward centralization of manufacturing facilities developed in the first three decades of this century, many of these small plants were abandoned and their dams and appurtenances allowed to fall into disrepair. Some were swept away never to be rebuilt again. Others were weakened by the ravages of time and maintenance allowed to lapse.

With the advent of modern truck transportation in the 1920's, manufacturers reversed their previous trend and began to decentralize some of their plants as the trucks made economical hauling of finished goods possible.

Such was the case of the Glasgo Finishing Company who came into the Pachaug River area and bought up a number of old dams and mills because of the clean available water. They have expanded constantly, have spread employment, and are endeavoring to place their dams in first class condition.

It is unfortunate that the Glasgo Company did not employ an engineer well versed in dam construction instead of endeavoring to design themselves. If they had done so, much needless expense to them would have been saved and their work would have been better suited to conditions.

The same thing appears to be true of other owners such as Sundholm, Gordon Brothers, Ace Woolen Company, and the Ashland Corporation.

We assume that these owners to a large extent proceeded in ignorance of the State Law governing construction of dams.

The Board, in the case of much of the work done on the Pachaug River, is faced with a fait accompli; and therefore I have, under the circumstances, not felt that we should issue certificates for these dams when we are not familiar with all details of construction. The single exception to this is the Glasgo Dam, with which we are quite familiar. I shall issue the necessary certificate for this when the plans of the completed work are received.

STATE BOARD OF SUPERVISION OF DAMS
CONNECTICUT

SUMMATION
(2)

I believe that when all steps as recommended in each individual dam case have been taken, we may adjudge the situation on the Pachaug River as under control and in safe condition.

HYDROLOGIC DISCUSSION

The Pachaug River rises on the Eastern Connecticut, Rhode Island border at Beach Pond in heavily wooded, hilly country. Characteristic of the rugged topography is an average slope pitch around the headwaters of 50' in a thousand. Even with this heavy wooded growth, run-off is comparitively rapid and a coefficient of .20 has been assumed. The elevation of Beach Pond is 296, Geologic survey datum and is source of the Pachaug.

The elevation at the mouth, confluence with the Quinebaug at Jewett City, is 100, Geologic Survey datum. Thus through its meandering course of 14 miles, it shows a drop of almost 200'.

Geologic strata is mostly granite and gneiss overlaid with glacial moraines of gravel and boulders with some interweaving clay deposits.

From Colonial and Revolutionary days, dams have been built at various points along the river to provide power for grist and sawmills, for a foundry, and for various textile manufacturing processes. The present Glasgo dam is built on the foundations of an original dam constructed by a negro by the name of Glasgo (for whom the village is named) and iron was smelted from Bog Ore for the manufacture of Harpoons which were famous throughout the old Whaling industry.

In the past century, several severe floods have caused considerable damage mainly through the breaking of one or more of the upper dams. Since 1860 there have been two disastrous floods caused by the breaking of dams. One, in 1868, when several of the upper dams went out causing what was then called the Jewett City dam to go out and cause considerable property damage. The other took place in the spring freshet of 1888 when Slater Dam went out with attendant damage. For the past fifty years and since the construction of Pachaug Dam, a series of storage ponds and reservoirs assist in breaking peak flows and averaging them out. If it were not for this storage factor, the spillway capacity of several of the dams would be much too small to take flash floods.

On only two occasions since reliable rain-gauge recordings were made in this watershed has the rainfall exceeded 4". Computations after thorough check of records and stream flow have been based on a 5" rainfall.

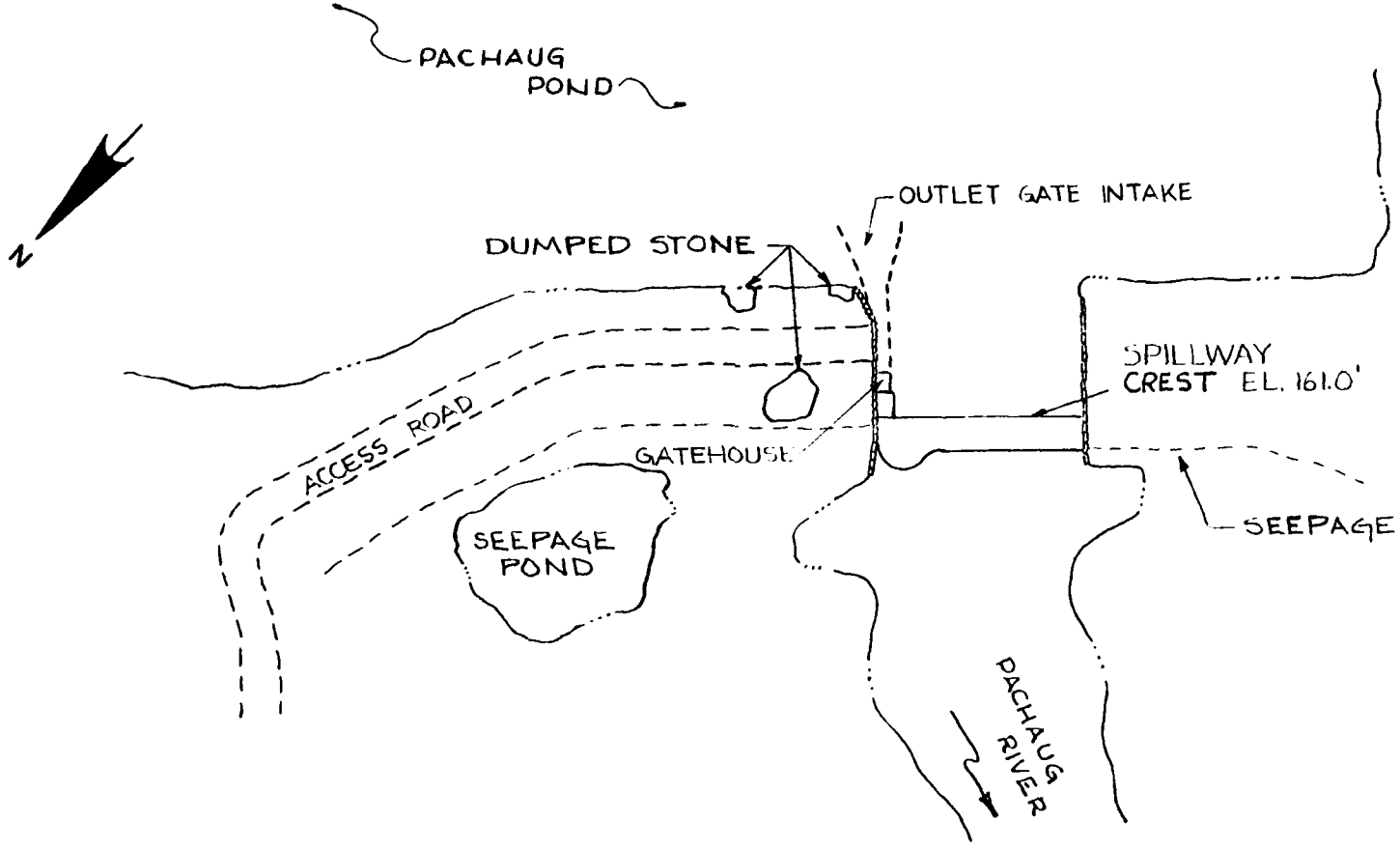
The greatest flow on record occurred on September 21, 1938, at the time of the Hurricane.

HYDROLOGIC DISCUSSION

(8)

The U.S. Geological Survey gauged the flow over Slater dam,(last dam before confluence with Quinebaug) at 2340 sec. ft.. The watershed area above this dam is 59 square miles which corresponds to a flow of 38 sec.ft./sq.mi. at that time. This record flow took place at a time when all ponds were full and spillways taking near maximum capacity because of the several days heavy rain which preceded the flood and hurricane.

The safety of this chain of 13 dams is particularly interdependent. The failure of almost any one could possibly lead to the overtopping and failure of all lying below it on the stream. It is, therefore, imperative that they all be kept in excellent repair.

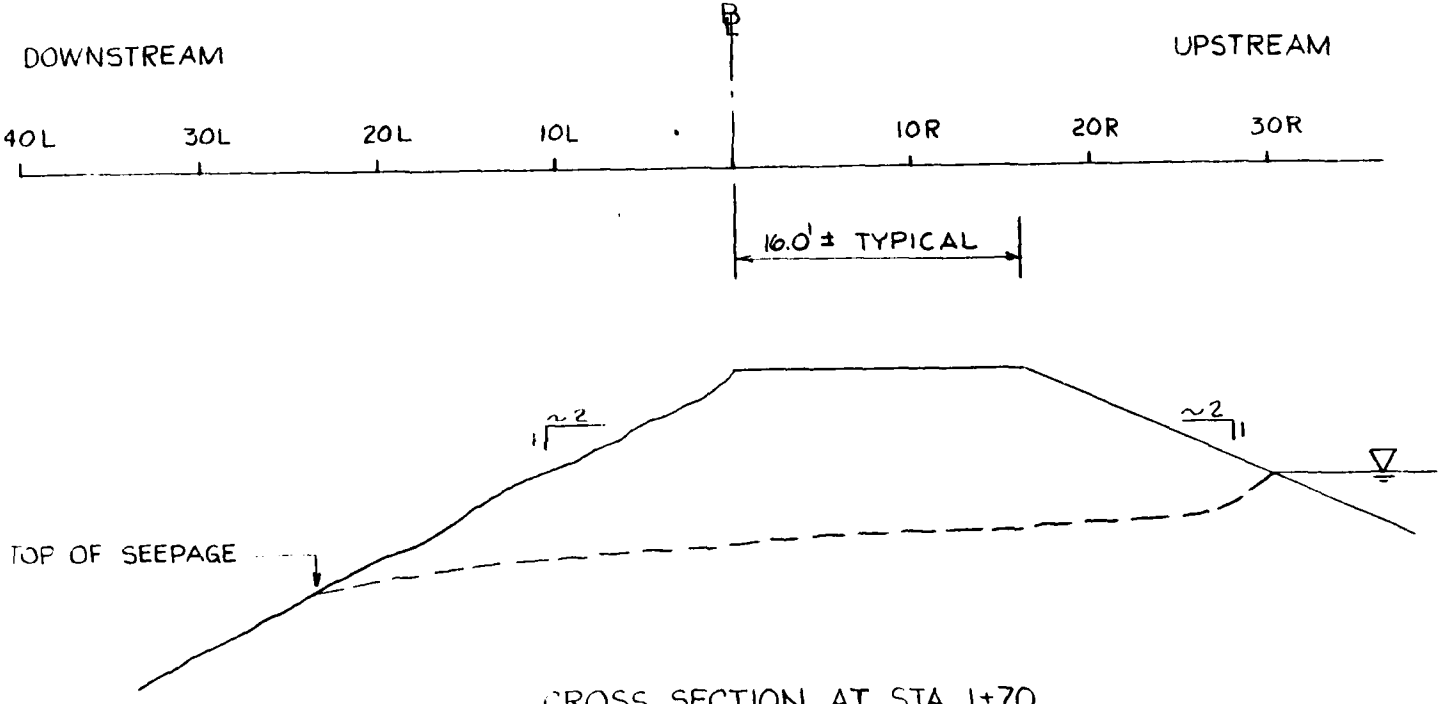


PLAN
SCALE: 1" = 100' ±

PACHAUG POND DAM

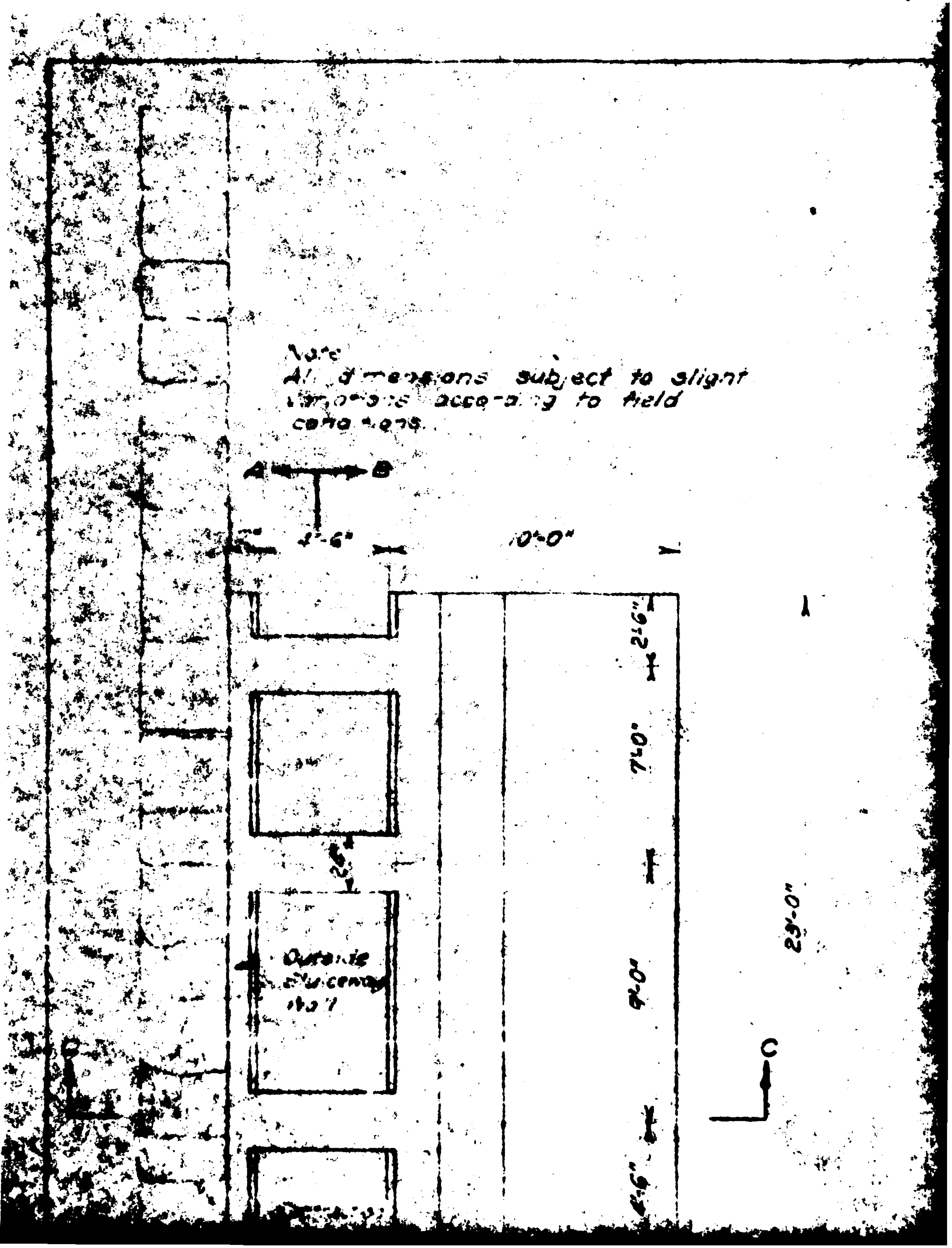
SHEET 1 OF 2

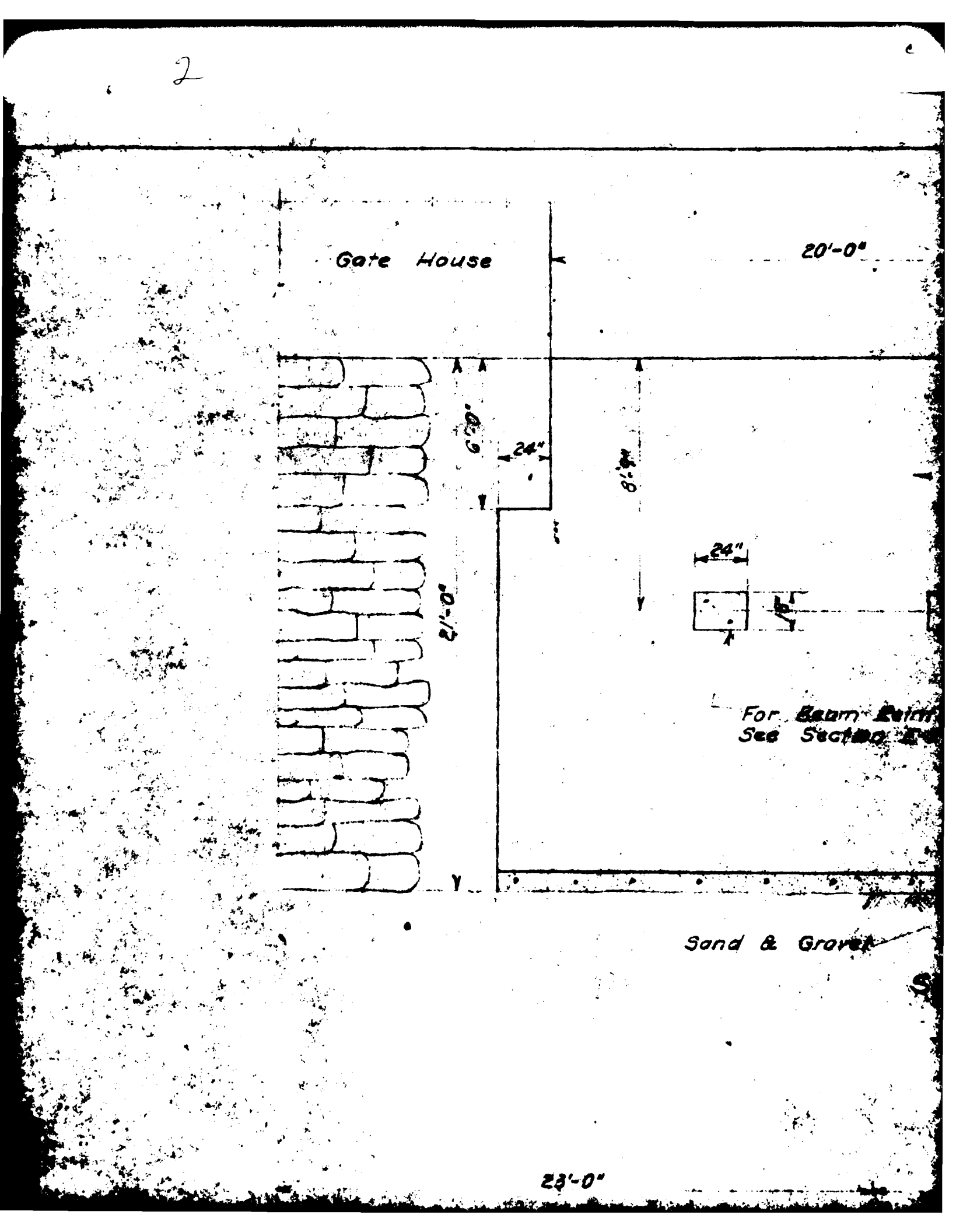
(2-13)



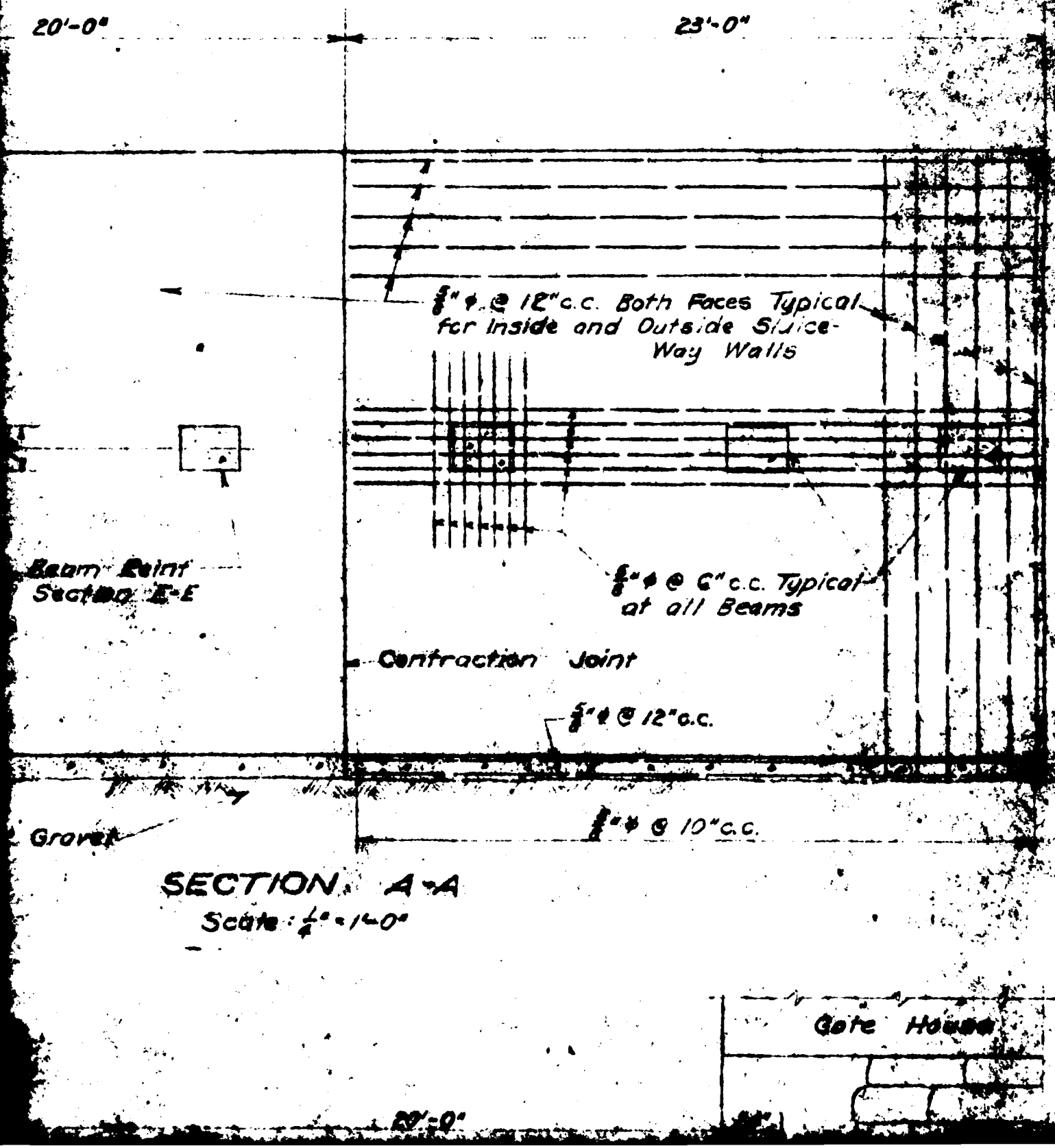
CROSS SECTION AT STA. 1+70

NOTE: STA. 0+00 LOCATED AT FACE OF RIGHT SPILLWAY TRAINING WALL


Note
All dimensions subject to slight variations according to field conditions.
A
B
4'-6"
10'-0"
2'-6"
7'-0"
2'-6"
9'-0"
29'-0"
4'-6"
C

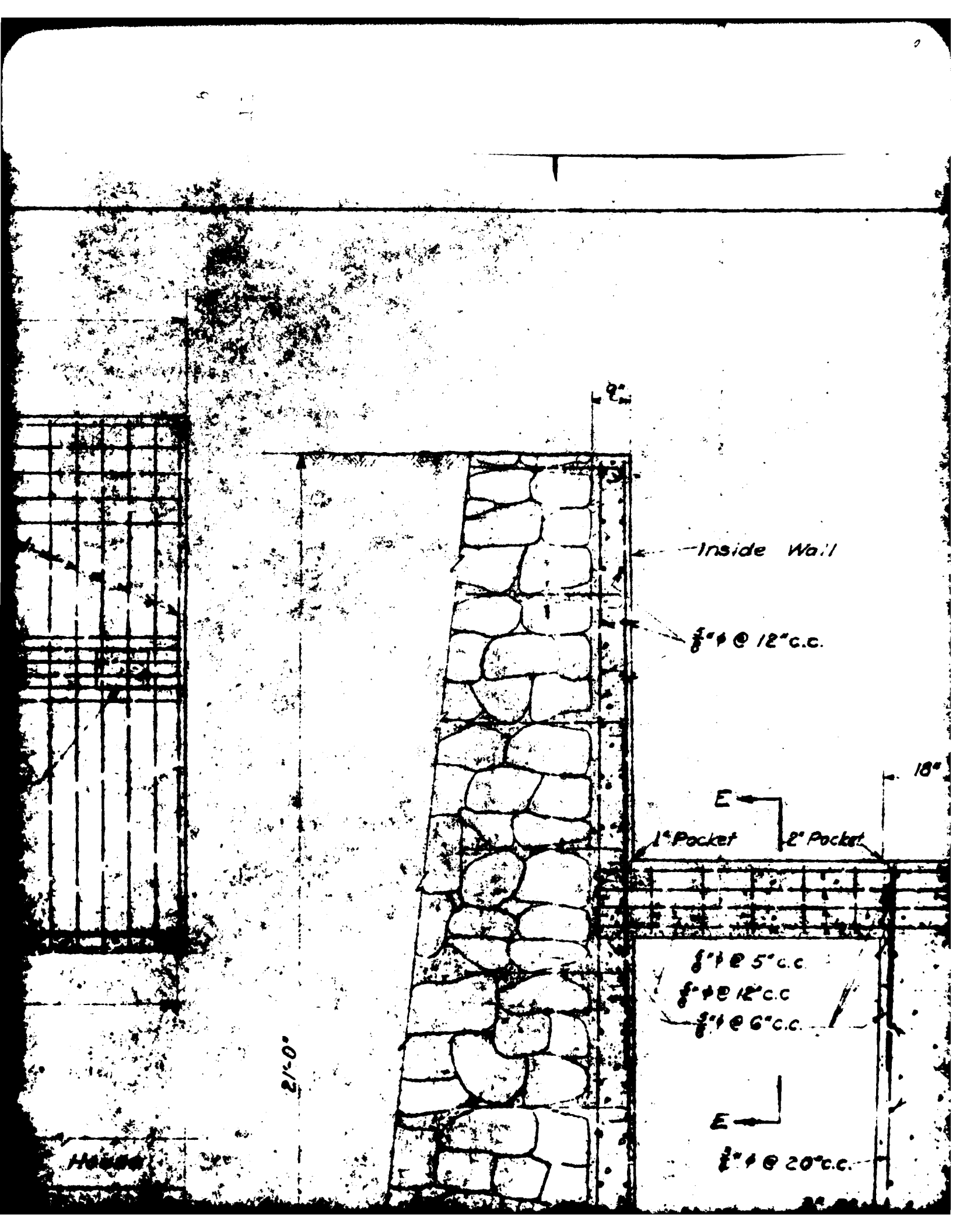

Gate House
20'-0"
24"
8'-0"
24"
21'-0"
For Beam Detail
See Section E
Sand & Gravel
23'-0"

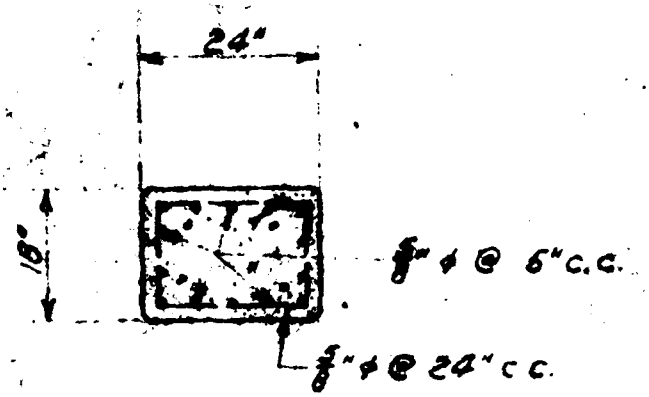
3



SECTION A-A

Scale: ¼" = 1'-0"


Inside Wall
⅝" ϕ @ 12" c.c.
18"
E
1" Pocket
2" Pocket
⅝" ϕ @ 5" c.c.
⅝" ϕ @ 12" c.c.
⅝" ϕ @ 6" c.c.
E
⅜" ϕ @ 20" c.c.
21'-0"

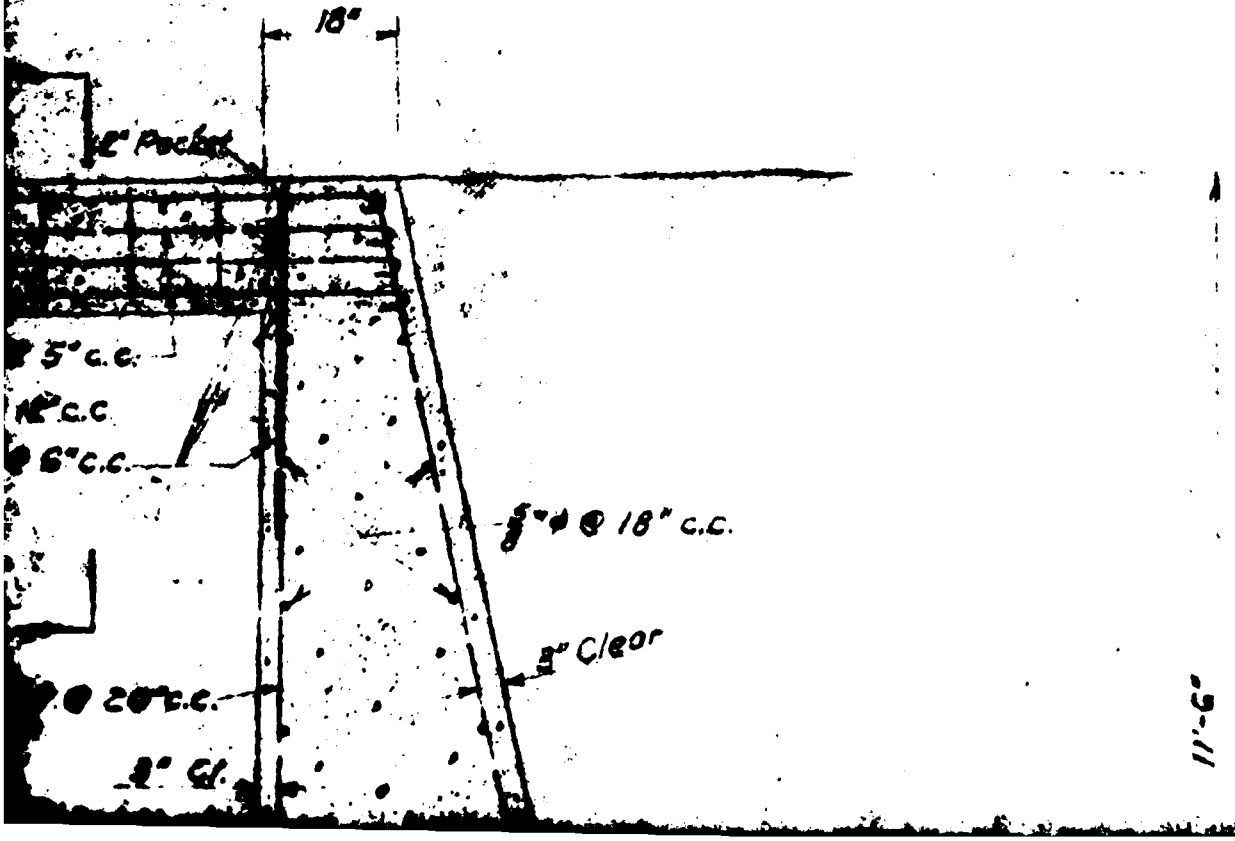


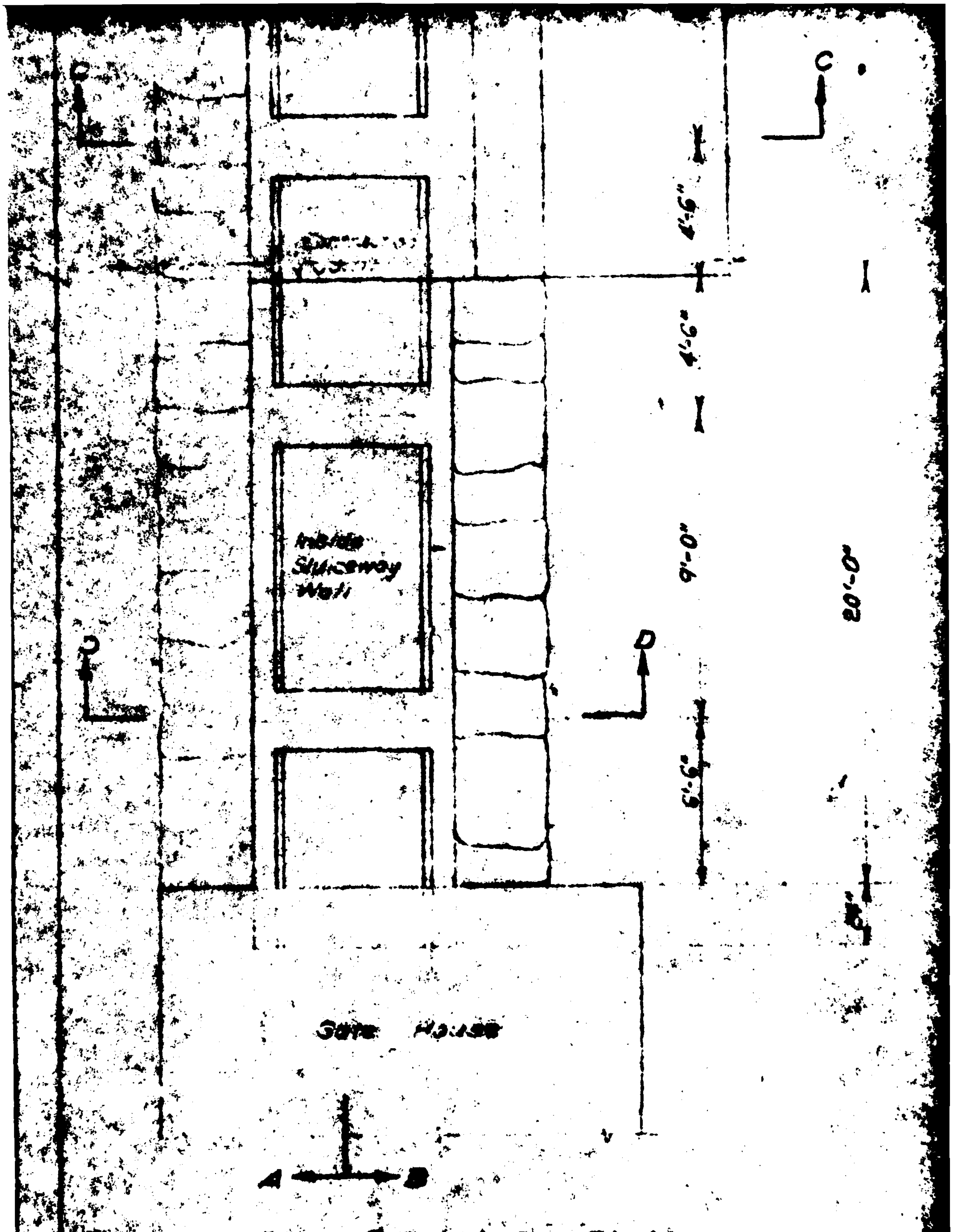
Wall

SECTION E-E

Scale: $\frac{1}{2}$" = 1'-0"

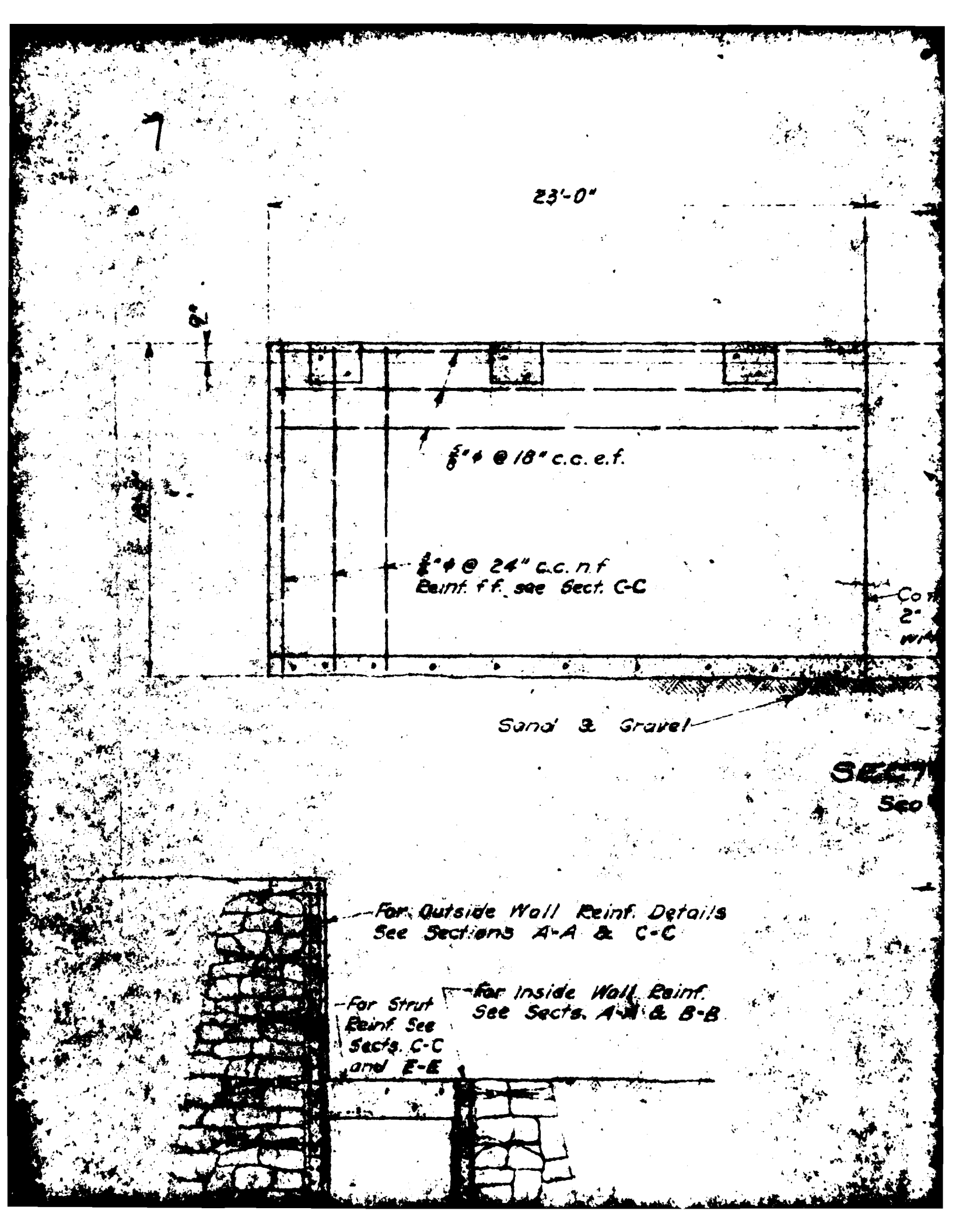
18" c.c.

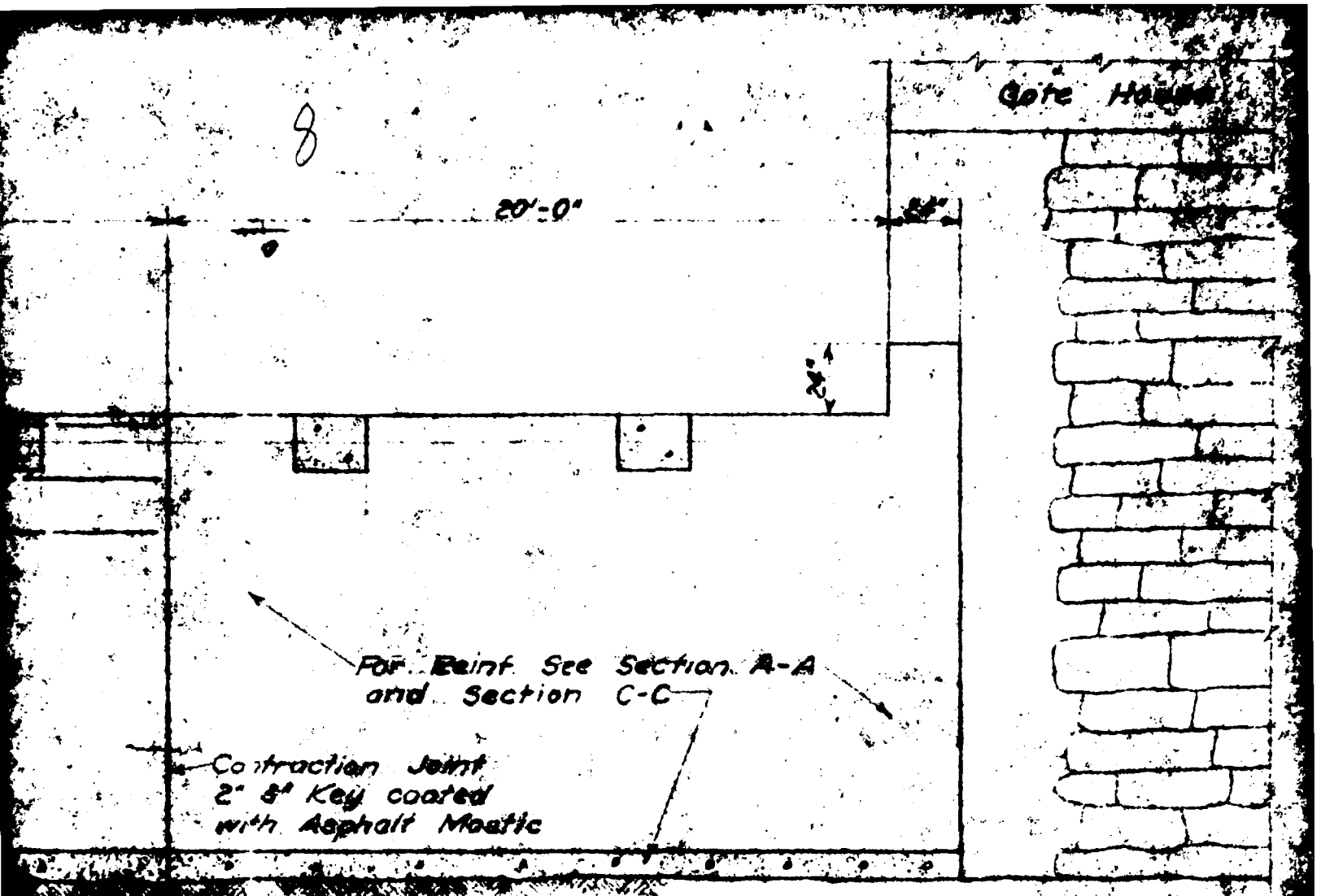




SLUICEWAY PLAN

Scale [illegible]"=1'-0"

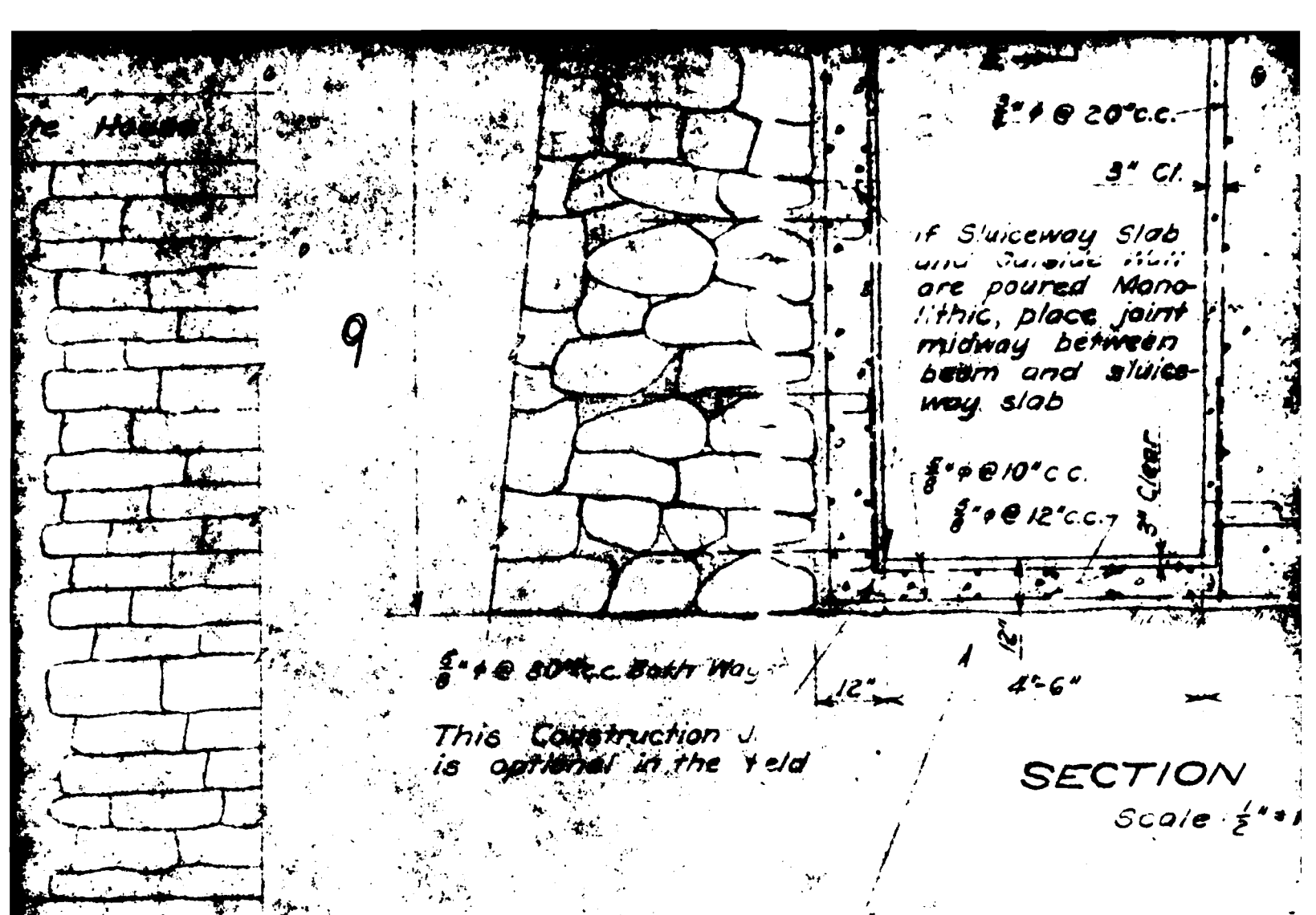

23'-0"
5/8" ϕ @ 18" c.c. e.f.
3/4" ϕ @ 24" c.c. n.f
Reinf. f.f. see Sect. C-C
Sand & Gravel
For Outside Wall Reinf. Details
See Sections A-A & C-C
For Inside Wall Reinf.
See Sects. A-A & B-B
For Strut
Reinf. See
Sects. C-C
and E-E



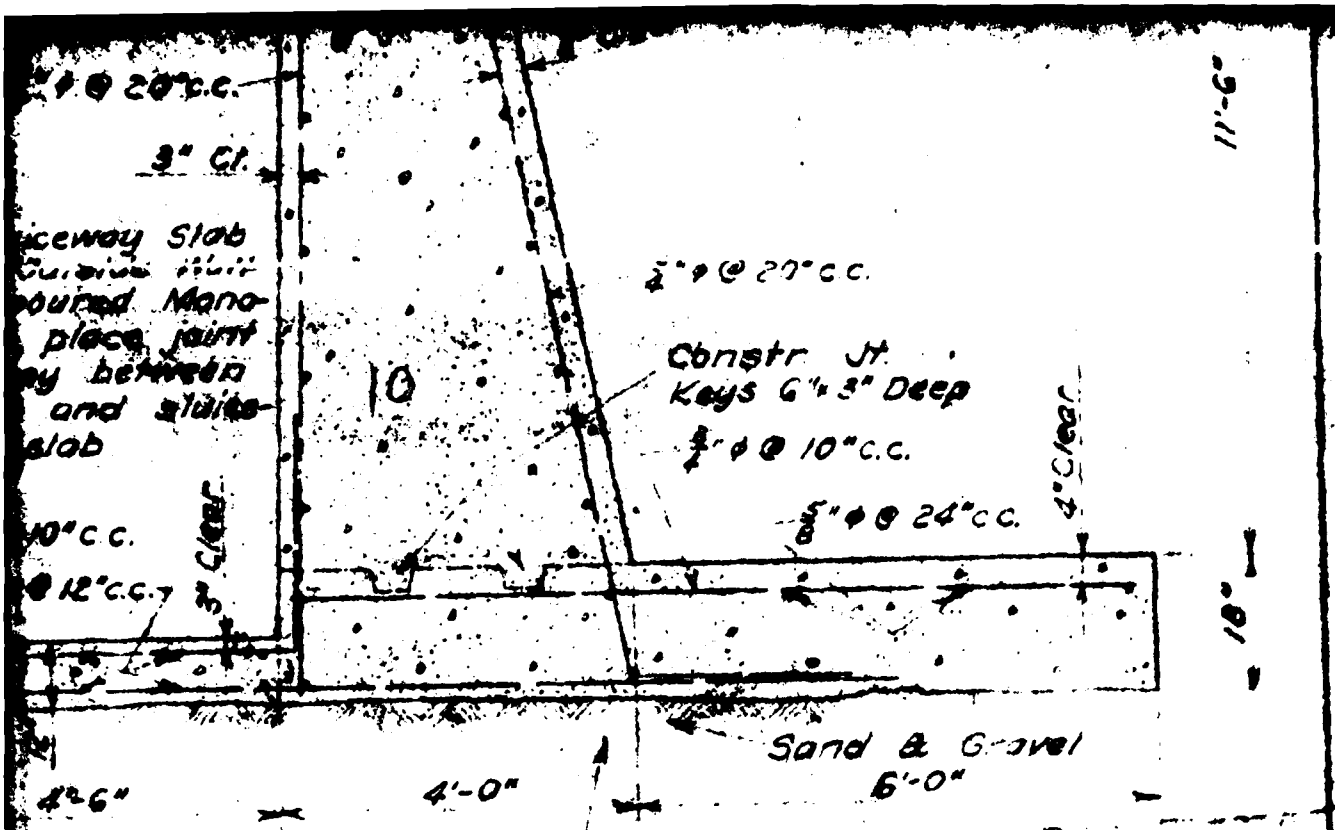
SECTION B-B

Scale 1" = 1'-0"

Before pouring floor
wall bentonite clay (
be thoroughly worke
depth of about 6" to
bank-run sand and g
prepared foundation b



pouring floor slab and base of retaining
ntonite clay (K W K Volclay No. 3&4) is to
roughly worked into the foundation to
of about 8" to 10" and tamped. About 2" depth
un sand and gravel will be placed over the
d foundation before placing concrete.

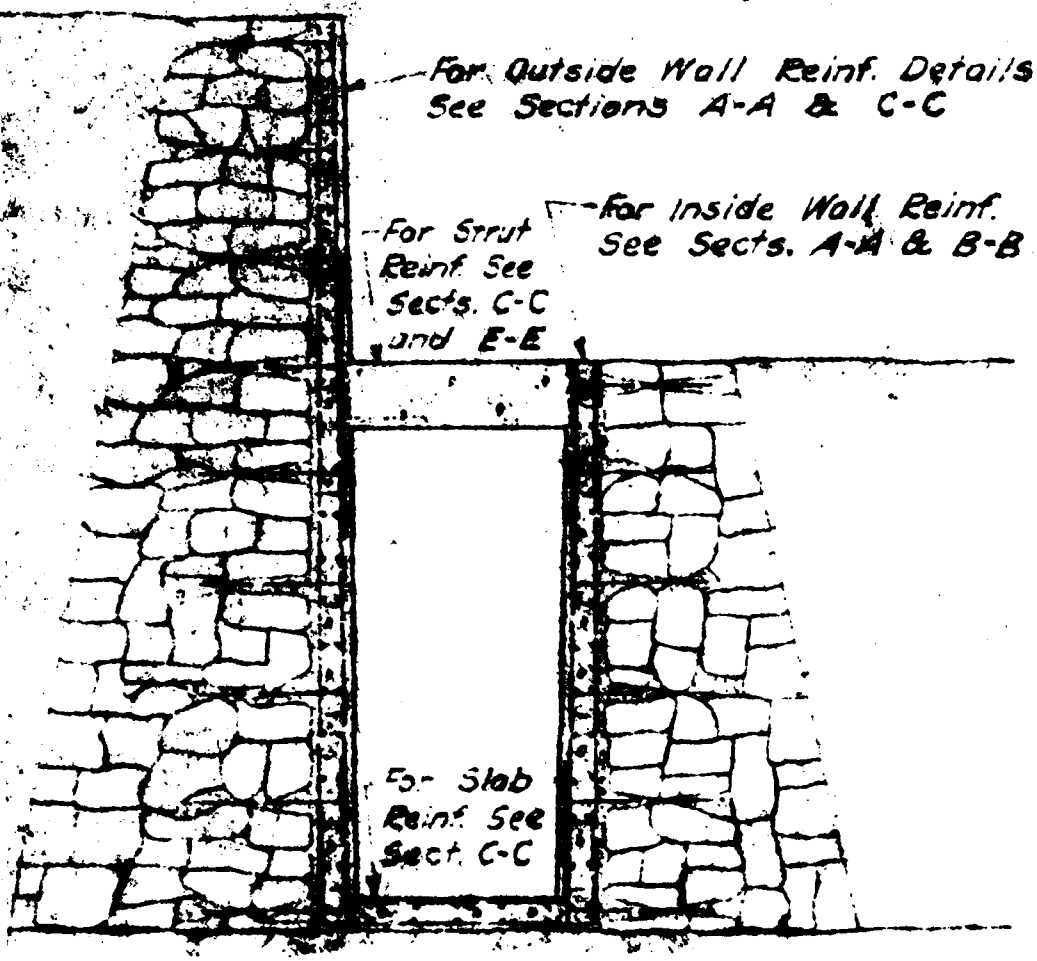


SECTION C-C

Scale $\frac{1}{2}$" = 1'-0"

OUTLET WORKS DETAILS
RECONDITIONING
RACHAUG STORAGE DAM
JEWETT CITY, CONN.

Sand & Gravel



SECTION D-D

Scale $\frac{1}{2}$" = 1'-0"

11

12

Before pouring floor slab and base of retaining wall bentonite clay (K W K Volclay No. 3[illegible]) is to be thoroughly worked into the foundation to a depth of about 8" to 10" and tamped. About 8" depth bank-run sand and gravel will be placed over the prepared foundation before placing concrete.

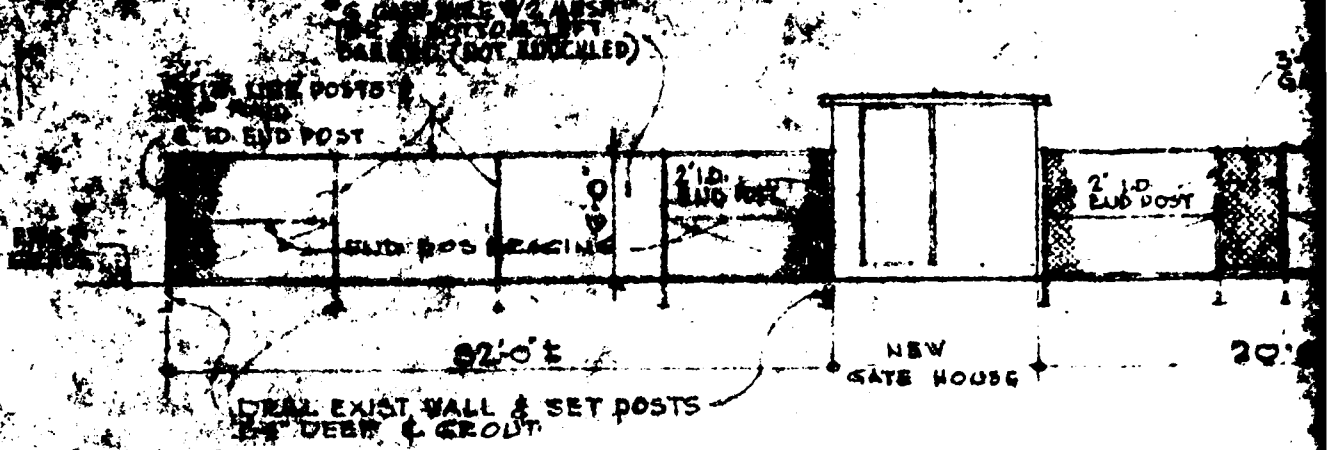
OUTLET WORKS DETAILS
RECONDITIONING
PACHAUG STORAGE DAM
JEWETT CITY, CONN.
UNITED MERCHANTS & MFRS. MANAGEMENT CORP. - ENGINEERS

AMBURSEN DAM COMPANY

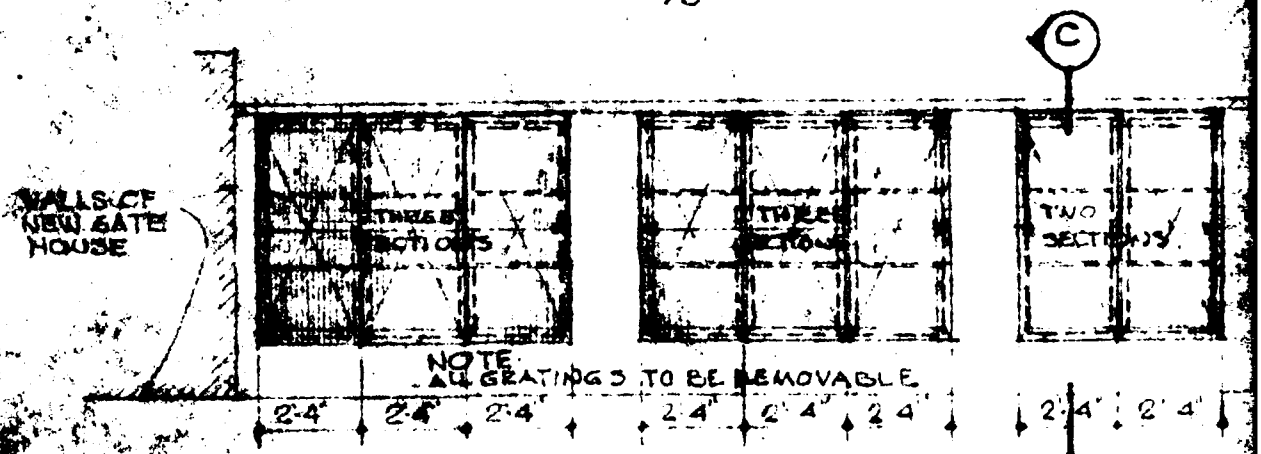
NEW YORK — ENGINEER-CONSTRUCTORS — SAN FRANCISCO

DRAWN R.A. 5-16-44	REVISED R.A. 6-25-44	DRAWING NUMBER 4403
TRACED	CHECKED	SHEET NUMBER 1
APPROVED E.H.B. 5-17-44	SCALE AS SHOWN	

13

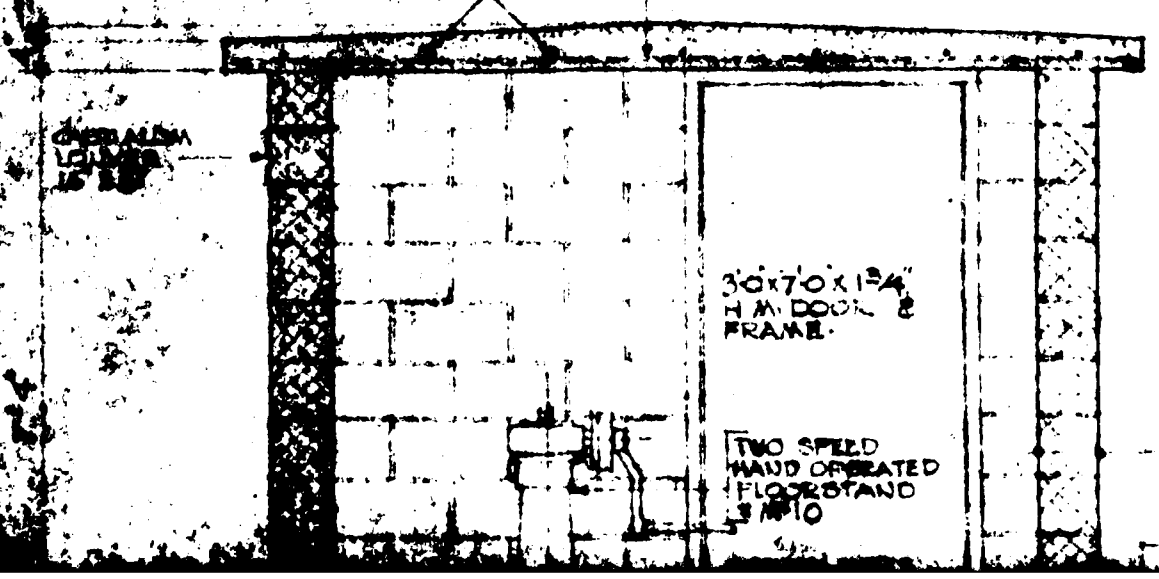


ELEVATION OF FENCE
SCALE 1/8" = 1'-0"

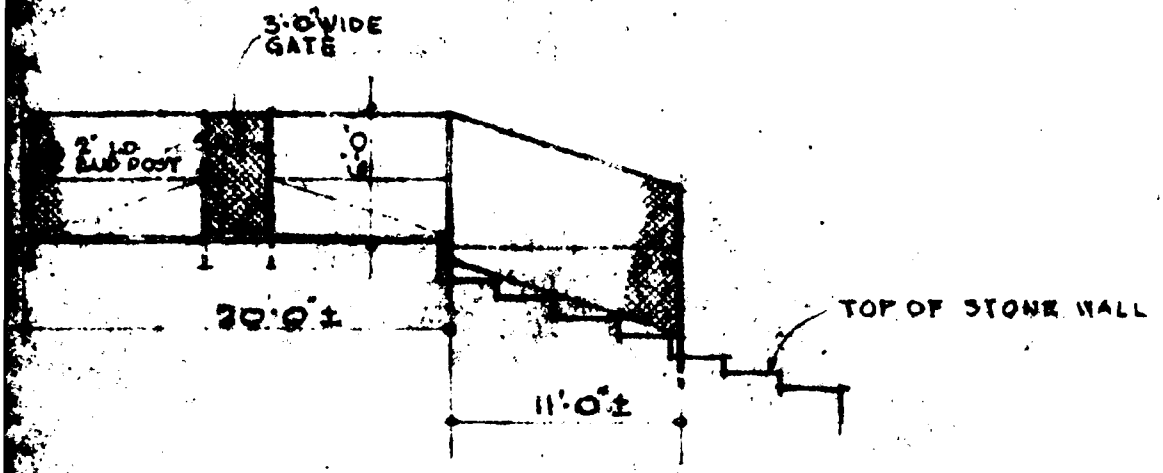


PLAN OF GRATINGS OVER EXIST. SLUICEWAY OPENINGS
SCALE 3/4" = 1'-0"

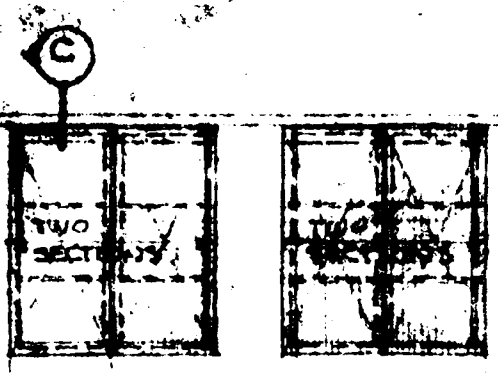
2"x2"x 1/4 ∠ FRAME
1½" ST. FLAT BAR ALL WELDED TO
TOP OF EXIST. WALL ELEV. 42.80'
#4 REINFORCING RODS 8" O.C.
#3 TEMP. RODS 1'-6" OC
¼" x 1½" ST. WELDED TO



2



ENCE



5'-0"

1½" ST. FLAT BARS SPACED 1"O.C. ALL WELDED TO ∠ FRAME

½" x 1½" ST FLAT BARS WELDED TO SLATS

DRILL 4" ∠ WITH SLOTTED HOLE & WELD ⅜" Ø BENT ST. PIN TO FRAME (2 PER GRATE SECTION)

SECTION "C-C"
SCALE ¾" = 1'-0"

4"x4"x⅜" ∠ SUPPORT DRILL & DOWEL INTO EXIST SLICEWAY WALL 6" DEEP @ 2'-4" O.C.

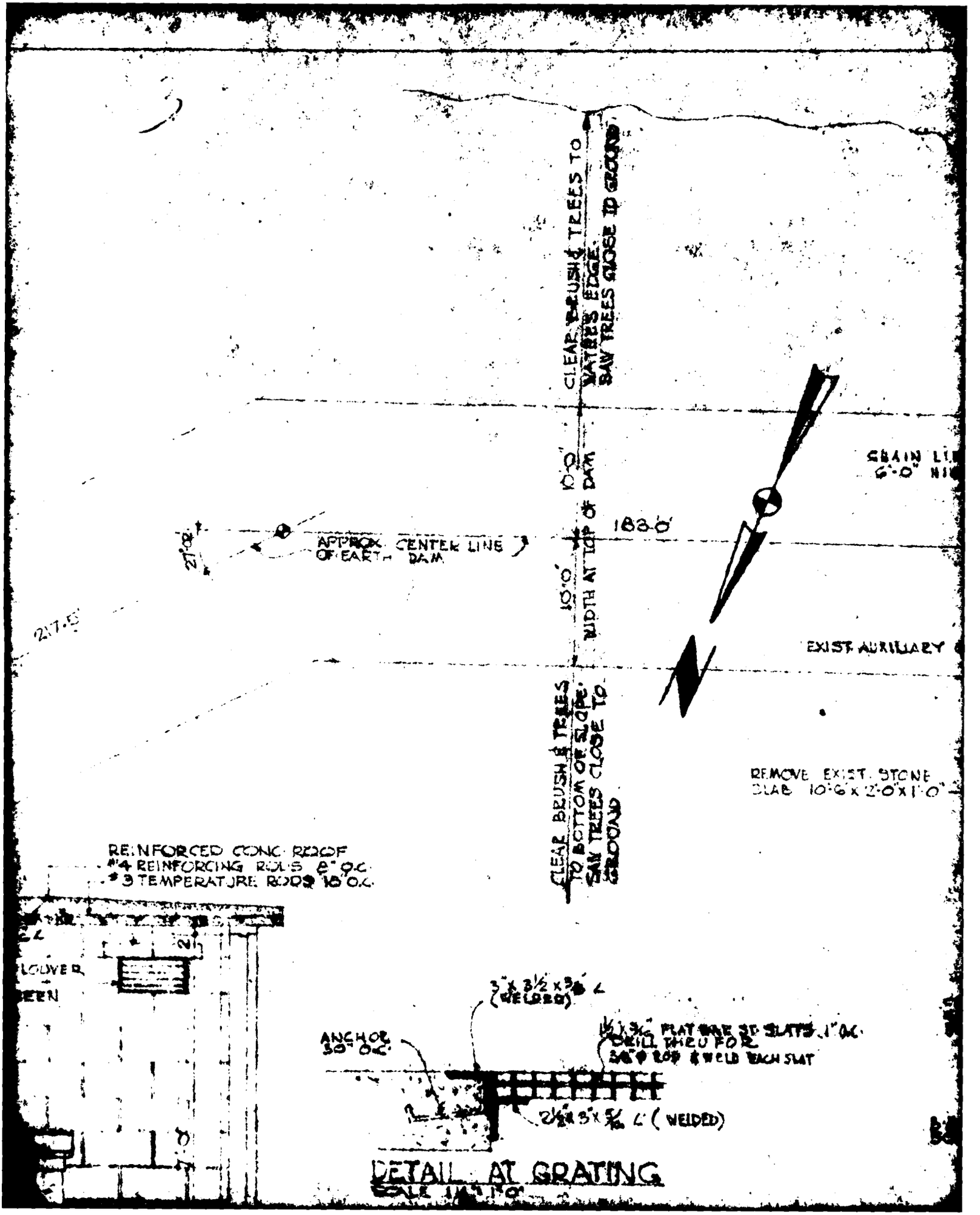
RE.NFORCE
#4 REINFORC
#3 TEMPERA

(2) 3½"x3½"x5/16" ∠

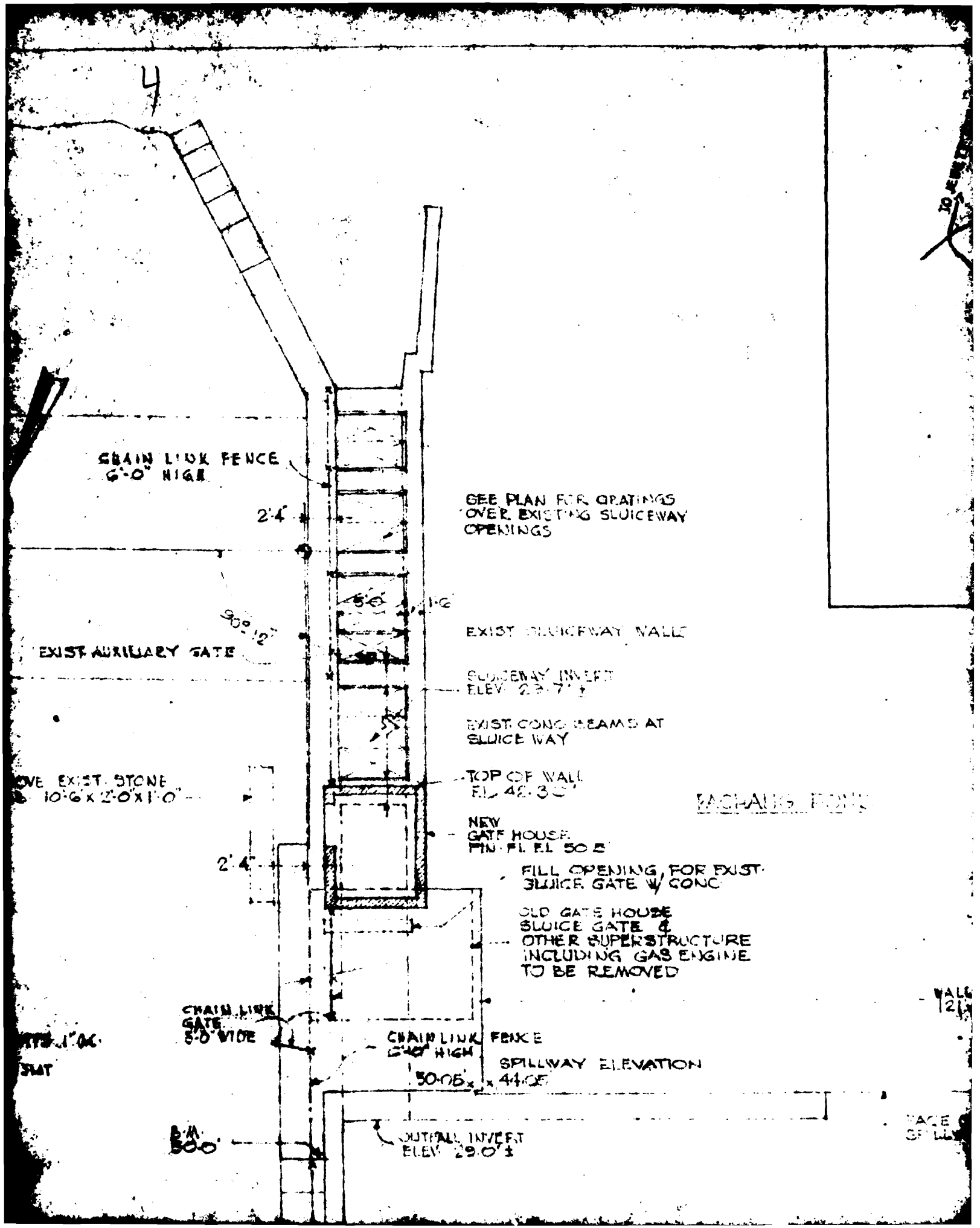
LIE CAST ALUM. LOUVER 16" W x 6" H W/ INSECT SCREEN

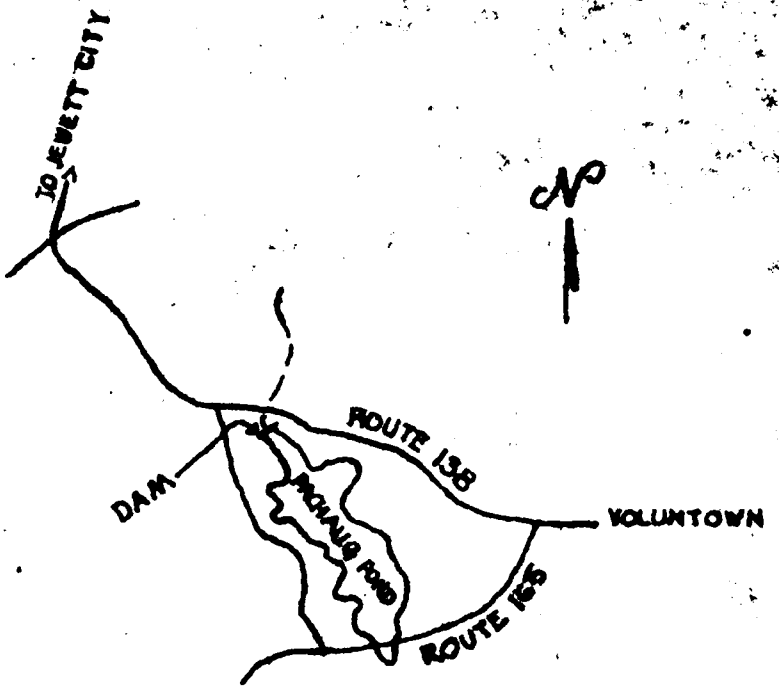
8" CONC. BLOCK WALLS W/ DURAWALL JOINT REINFORCING 2 COATS OF MASONRY PAINT

FLOOR STAND



DETAIL AT GRATING
SCALE 1/4" = 1'-0"


4
CHAIN LINK FENCE
6'-0" HIGH
2'-4"
SEE PLAN FOR GRATINGS
OVER EXISTING SLUICEWAY
OPENINGS
5'-0"
1'-6"
EXIST. SLUICEWAY WALL
EXIST. AUXILIARY GATE
SLUICEWAY INVERT
ELEV. 29.7'±
EXIST. CONC. BEAMS AT
SLUICE WAY
TOP OF WALL
EL. 48.3'
NEW
GATE HOUSE
MIN. FL. EL. 50.5'
2'-4"
FILL OPENING FOR EXIST.
SLUICE GATE W/ CONC
OLD GATE HOUSE
SLUICE GATE &
OTHER SUPERSTRUCTURE
INCLUDING GAS ENGINE
TO BE REMOVED
CHAIN LINK
GATE
5'-0" WIDE
CHAIN LINK FENCE
6'-0" HIGH
SPILLWAY ELEVATION
50.05' x 44.0'
B.M.
OUTFALL INVERT
ELEV. 29.0'±



KEY PLAN

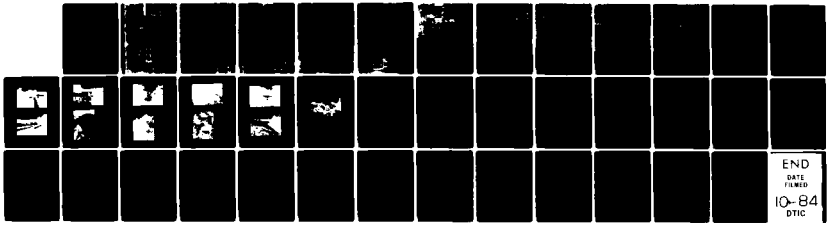
5

WALL TO WALL
21'-0"

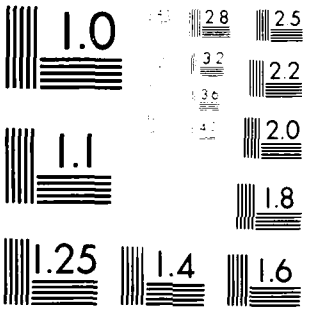
FACE OF EXIST
SPILLWAY

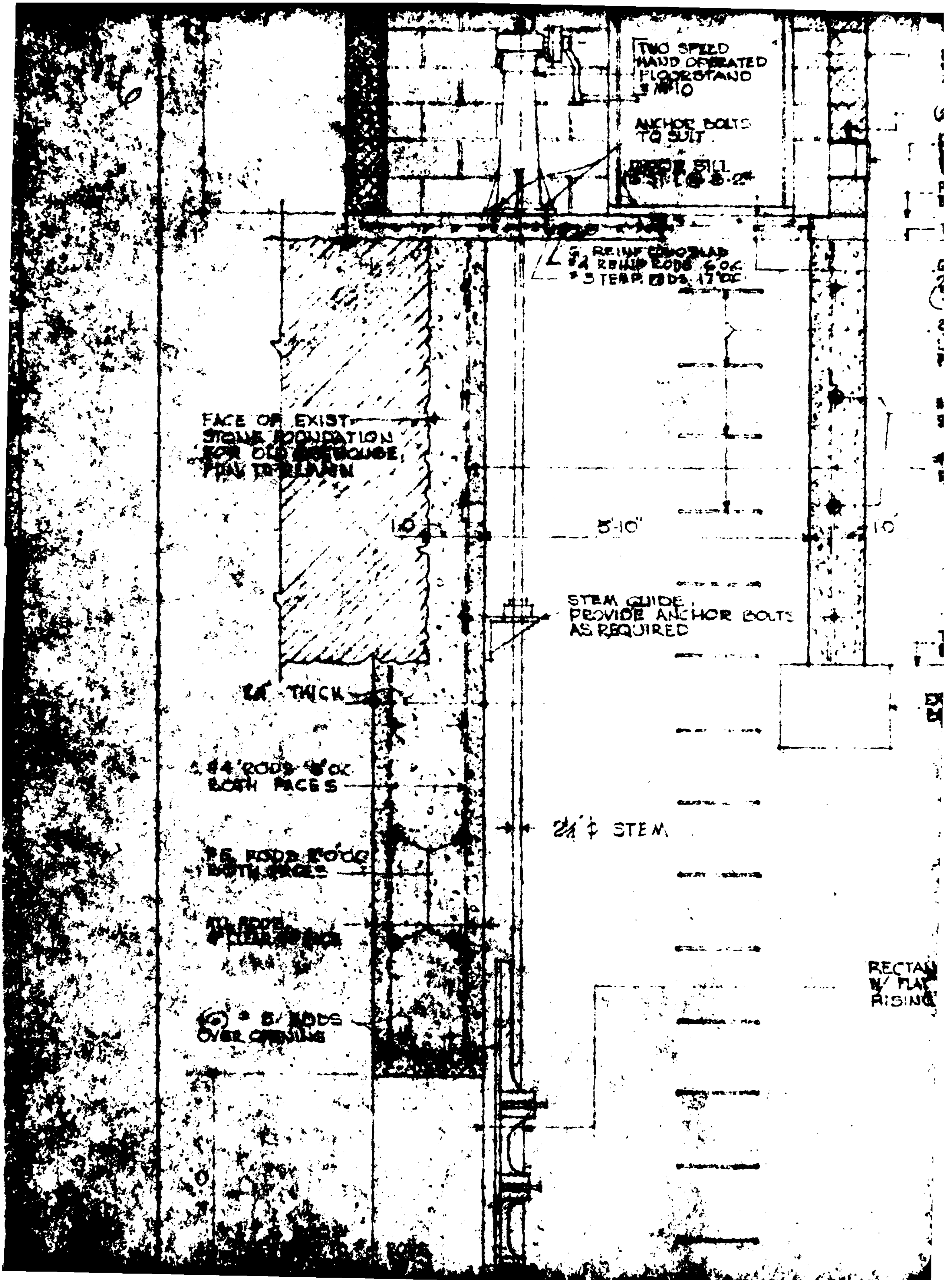
AD-A144 976 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
PACHAUG POND DAM (CT..(U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV SEP 78

UNCLASSIFIED F/G 13/13 NL



END
DATE FILMED
10-84
DTIC




TWO SPEED
HAND OPERATED
FLOORSTAND
ANCHOR BOLTS
TO SUIT
FACE OF EXIST.
STONE FOUNDATION
1'-0"
5'-10"
1'-0"
STEM GUIDE,
PROVIDE ANCHOR BOLTS
AS REQUIRED
THICK
BOTH FACES
STEM

8" CONC. BLOCK WALLS
W/ DURAWALL JOINT REINFORCING
2 COATS OF MASONRY PAINT

(2) 3½ x 3½ x 5/16" ∠'s

DIE CAST ALUM LOUVER
16" W. x 8" H.
W/ INSECT SCREEN

FINISHED FLOOR
ELEV. 50.5'

TOP OF FOUNDATION EL. 50.0'

GRATING 2-8" x 5'-0"
2 SECTIONS
(SEE DETAIL)

¾ ϕ DENT REINF. ROD
LADDER RUNGS
1'-4" O.C. VERTICALLY

#5 HORIZONTAL REINFORCING RODS
SPACED 2'-0" O.C.

#4 VERTICAL REINFORCING RODS
FULL HEIGHT OF WALL 5' O.C.

TOP OF BEAM
ELEV. 42.50'

EXIST. REINF. CONC.
BEAM 2'-0" x 1'-6"

DRILL EXIST. WALLS OF SLUICEWAY FOR
#6 DOWEL RODS 2'-0" O.C.
3" INTO EXIST. SLUICEWAY WALL

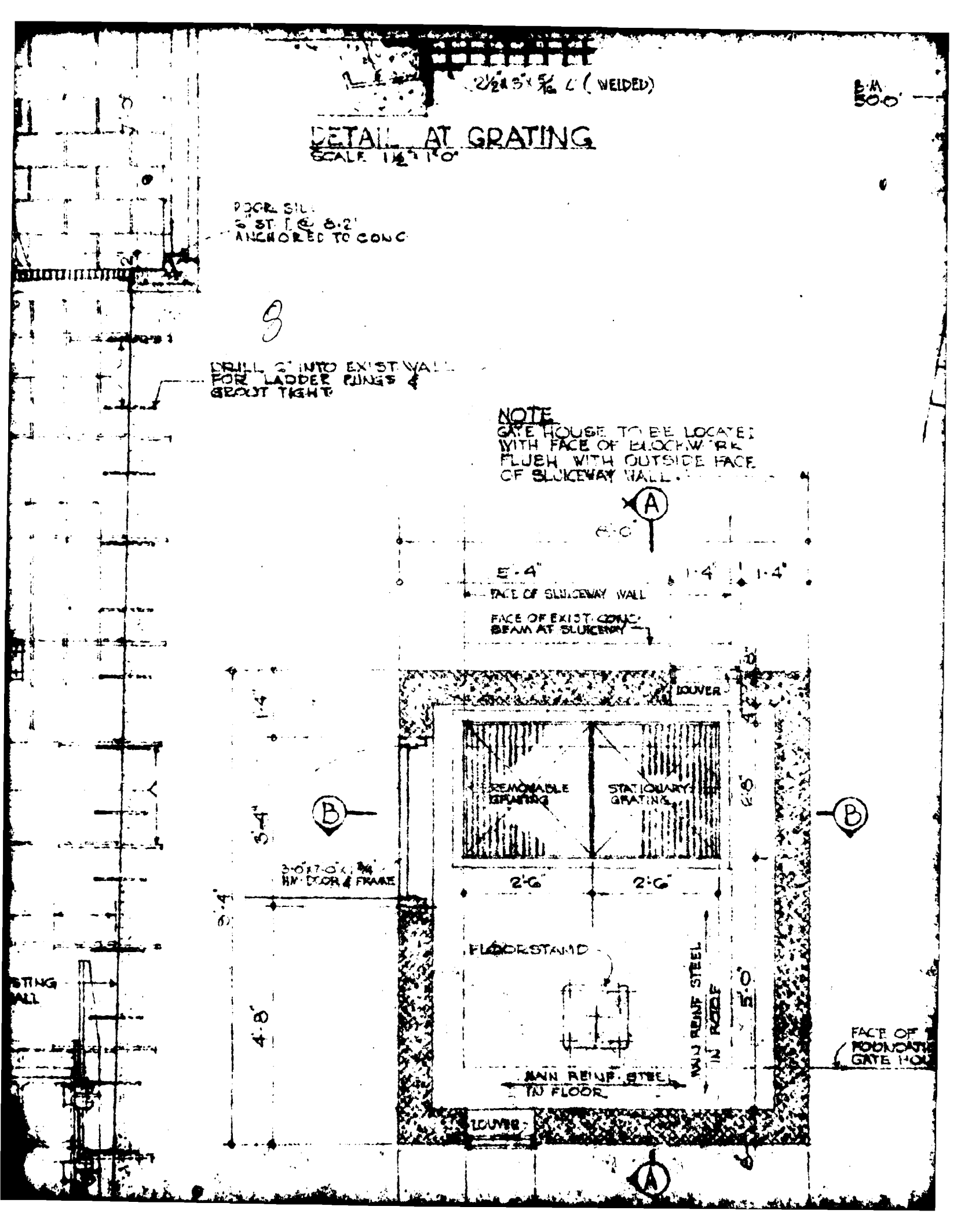
LAP REINFORCING RODS & DOWELS 24 DIAMETERS

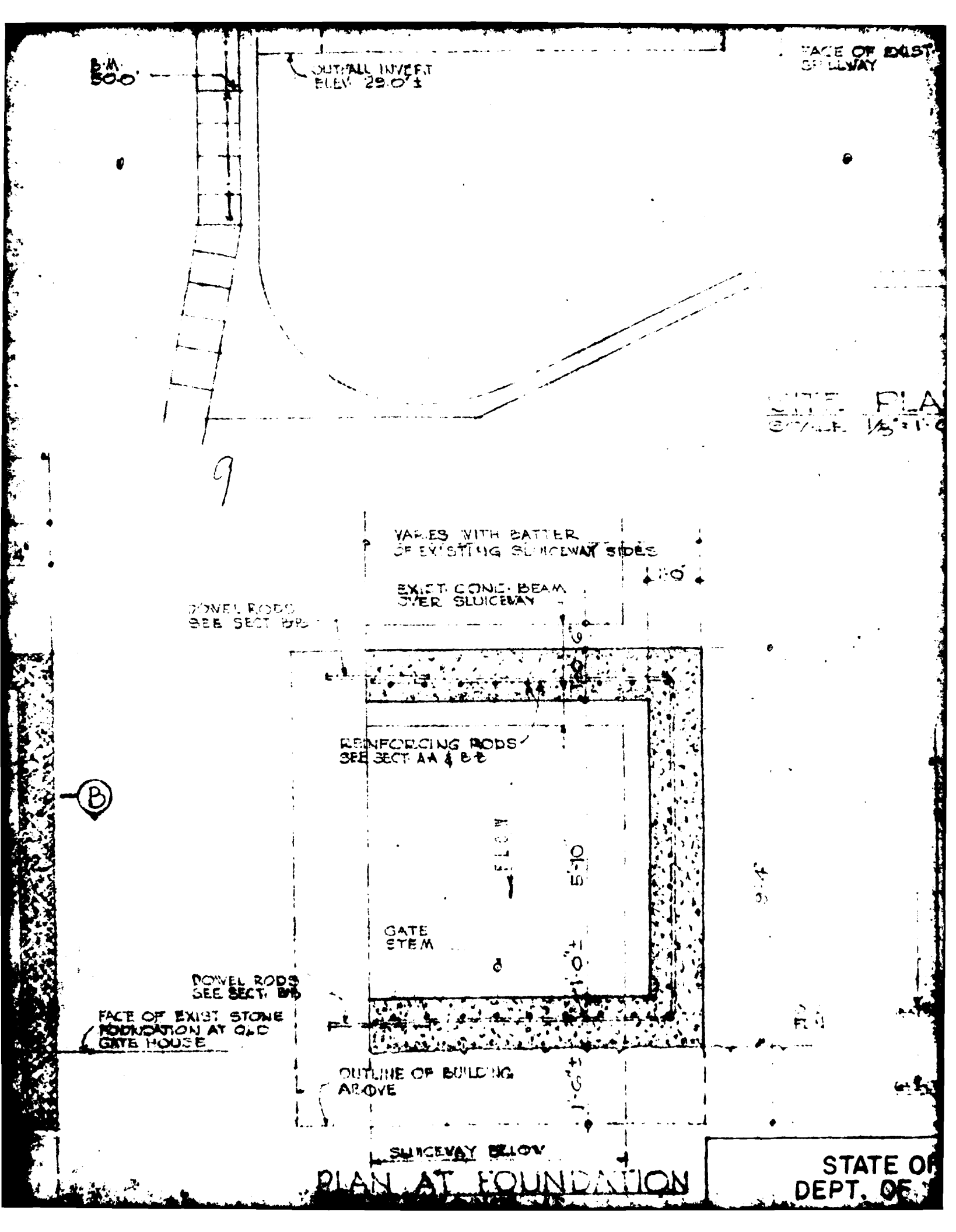
TANGULAR SLUICE GATE 36" W. x 48" H
FLAT FRAME & ADJUSTABLE SIDE WEDGES.
ING STEM TYPE. SEATING PRESSURE

FLOORSTAND

STEM GUIDE

FACE OF EXISTING SLUICEWAY WALL


2½ x 3½ x 5/16 ∠ (WELDED)
DETAIL AT GRATING
SCALE 1½" = 1'-0"
DOOR SILL
6" ST. [@ 8'-2"
ANCHORED TO CONC
DRILL 2" INTO EXIST. WALL FOR LADDER RUNGS & GROUT TIGHT
NOTE
GATE HOUSE TO BE LOCATED WITH FACE OF BLOCKWORK FLUSH WITH OUTSIDE FACE OF SLUICEWAY WALL.
A
B
6'-0"
5'-4"
1'-4"
1'-4"
FACE OF SLUICEWAY WALL
FACE OF EXIST. CONC. BEAM AT SLUICEWAY
LOUVER
REMOVABLE GRATING
STATIONARY GRATING
6'-0"
3'-0" x 7'-0" x 1¾" HM. DOOR & FRAME
2'-6"
2'-6"
FLOOR STAND
5'-0"
WWJ REINF. STEEL IN ROOF
MAIN REINF. STEEL IN FLOOR
LOUVER
FACE OF FOUNDATION GATE HOUSE
4'-8"
STING WALL



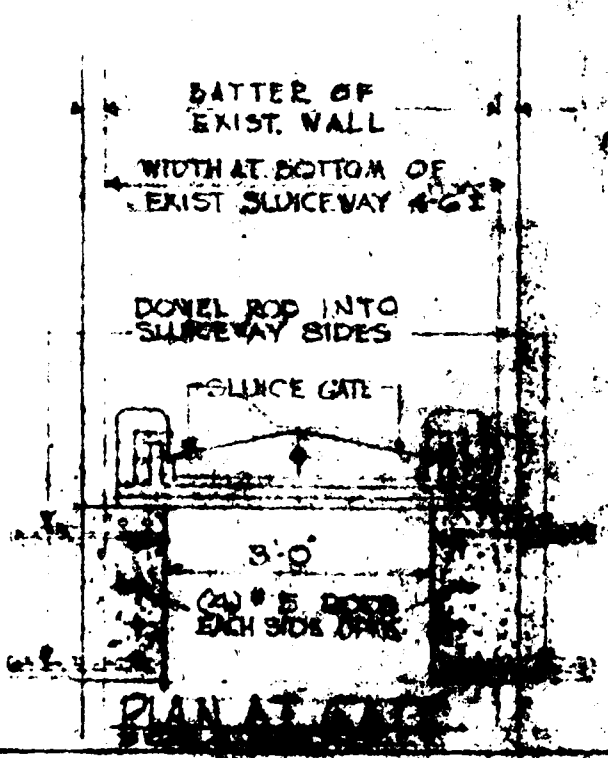
PLAN AT FOUNDATION

STATE OF
DEPT. OF

FACE OF EXIST. SPILLWAY

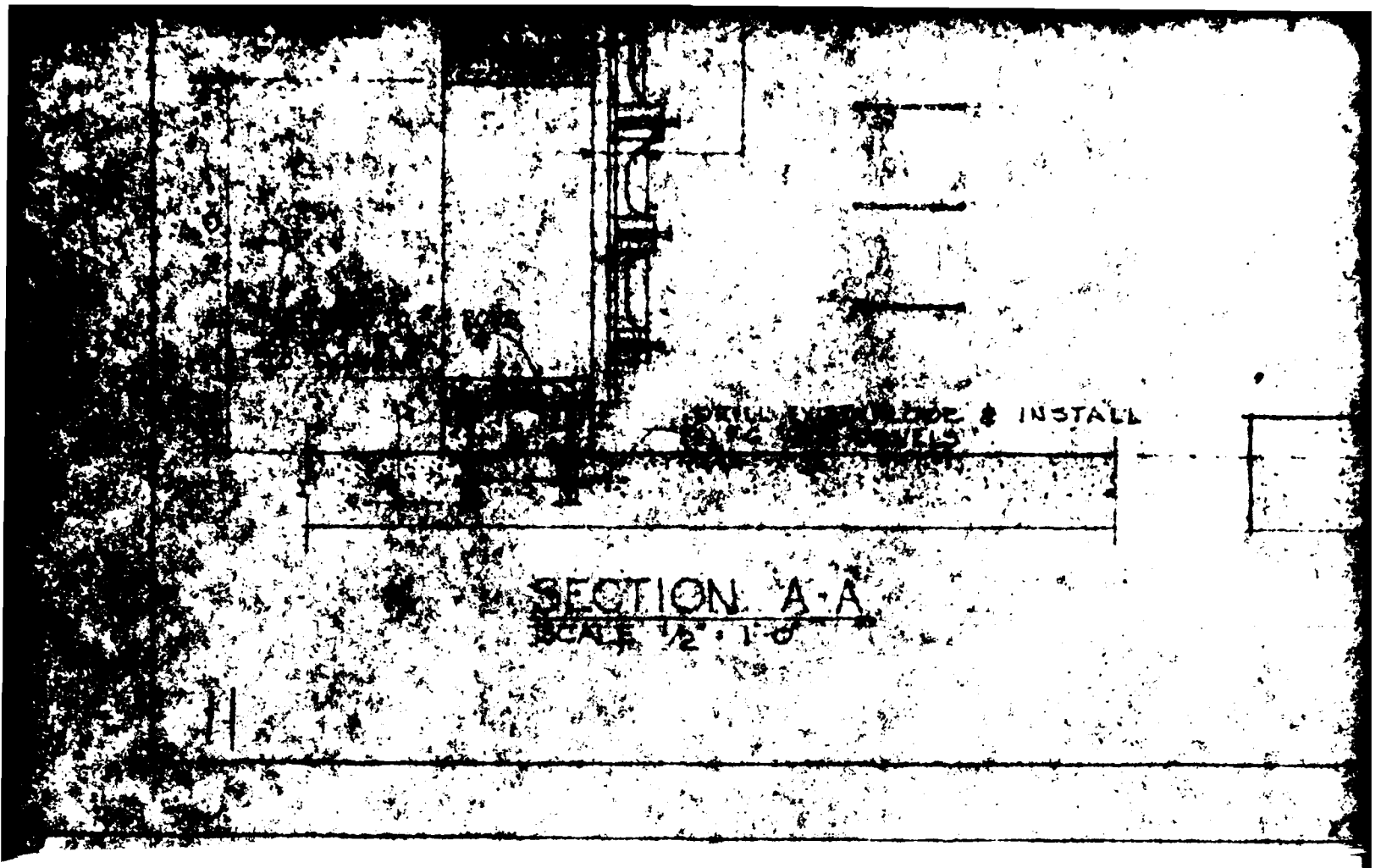
10

SITE PLAN
SCALE 1/8" = 1'-0"



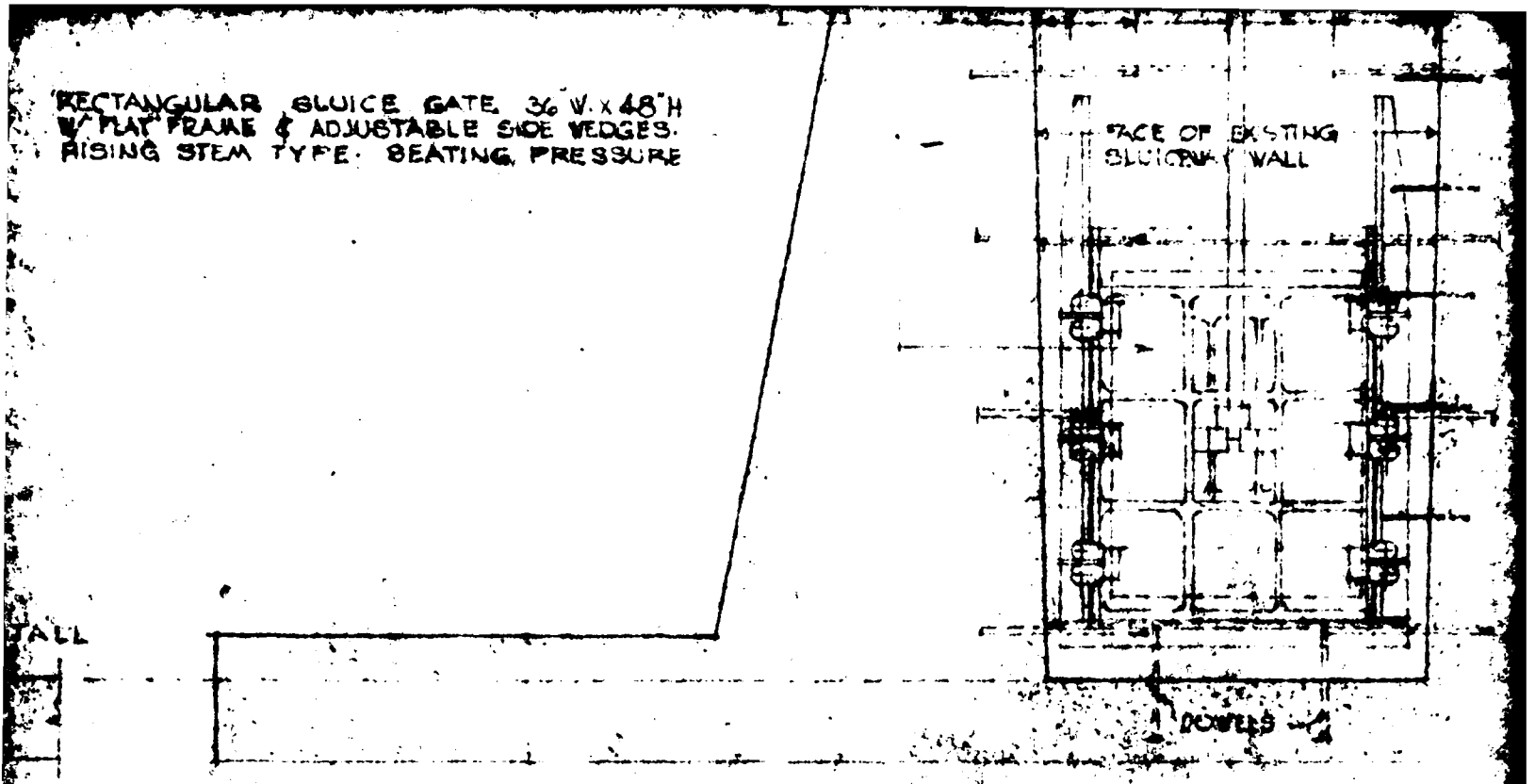
PLAN AT GATE

STATE OF CONNECTICUT
DEPT. OF FI



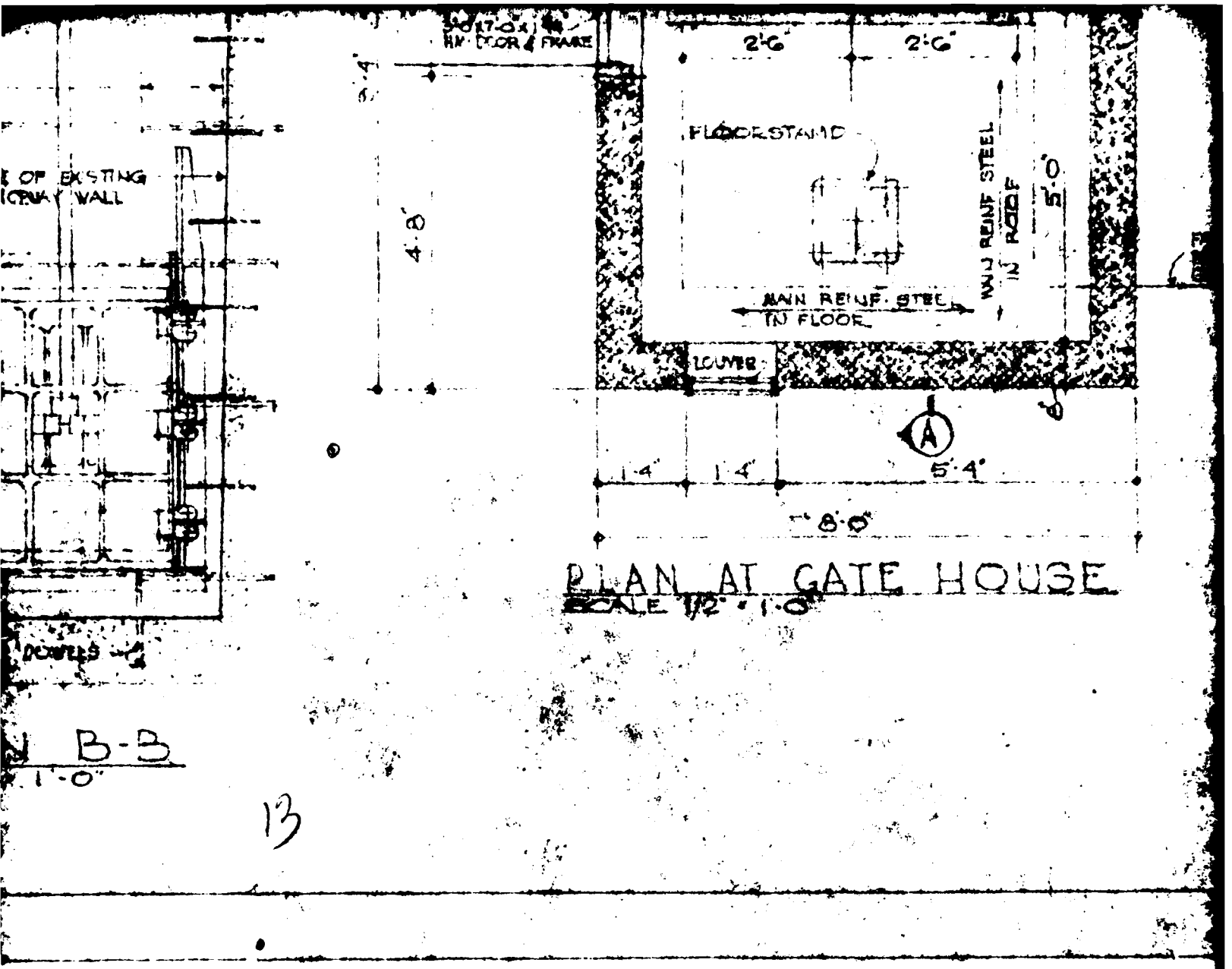
SECTION A-A
SCALE 1/2" : 1'-0"

RECTANGULAR SLUICE GATE 36"W. x 48"H
W/ FLAT FRAME & ADJUSTABLE SIDE WEDGES.
RISING STEM TYPE. SEATING PRESSURE



SECTION B-B
SCALE 1/2" = 1'-0"

12



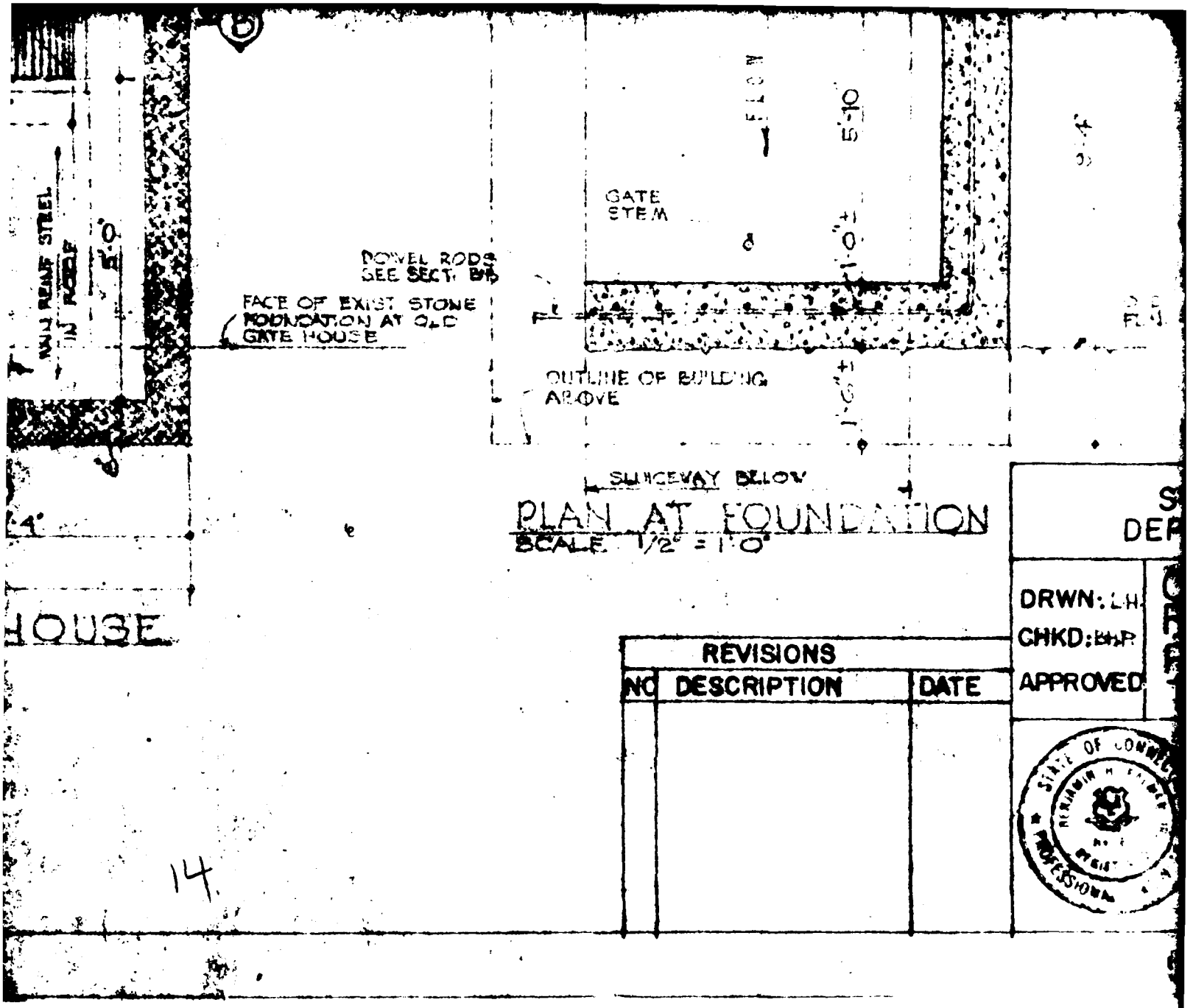
PLAN AT GATE HOUSE

SCALE 1/2" = 1'-0"

B-B

1'-0"

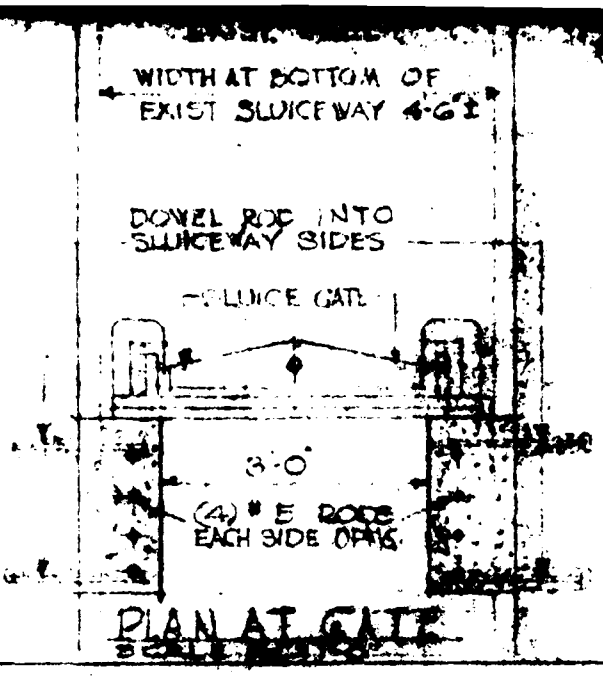
13



DRWN: L.H.
CHKD: B.H.P.
APPROVED

REVISIONS		
NO	DESCRIPTION	DATE

14



PLAN AT GATE

STATE OF CONNECTICUT
DEPT. OF FISHERIES & GAME

DRWN: LH
CHKD: BHP
APPROVED

CONTROL GATE & REPAIRS TO DAM PACHAUG POND DAM TOWN OF GRISWOLD, CONN.

PROJ. NO.

DRAWING 1

DATE

CHANDLER & PALMER
ENGINEERS
NORWICH, CONN.

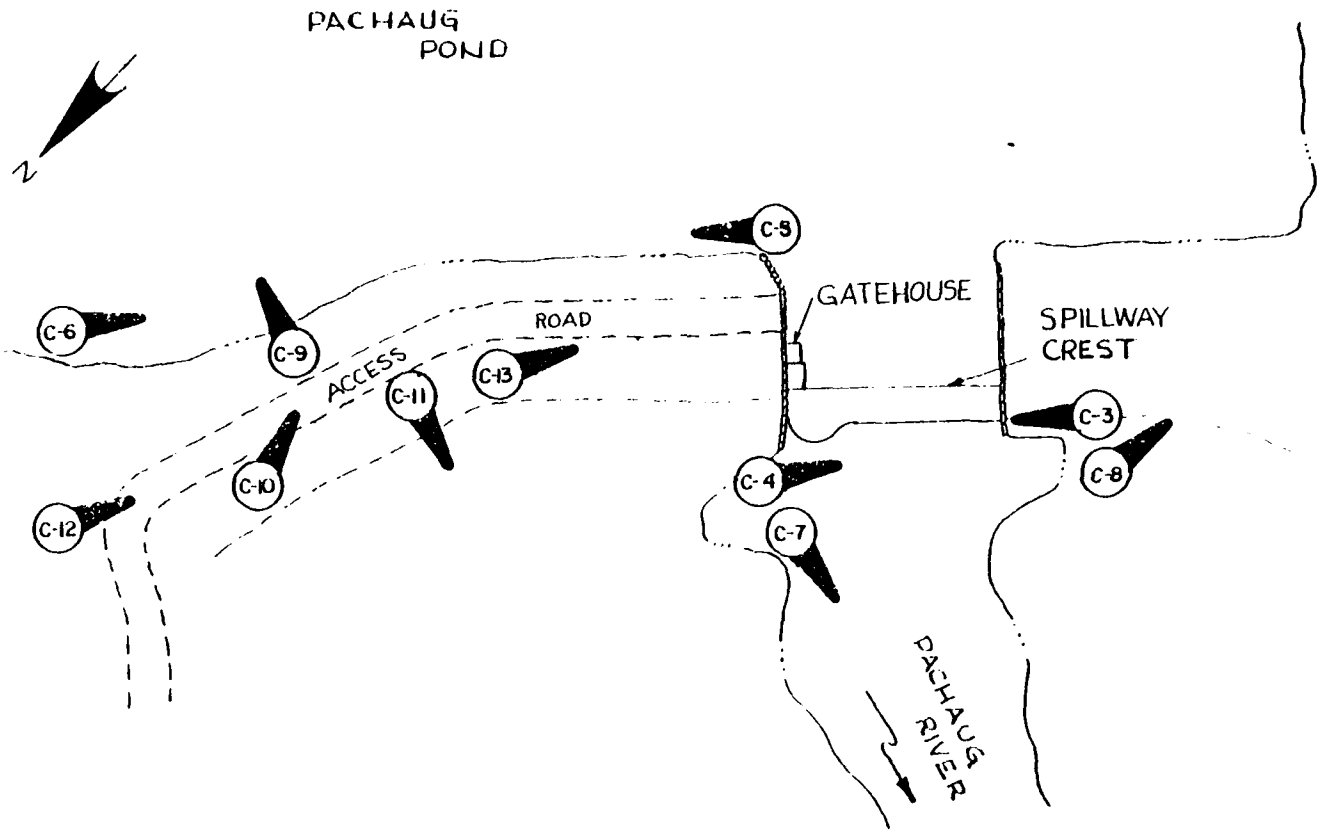
SCALE: AS NOTED

DATE SEPT. 23, '66

Plate No. 3

APPENDIX C

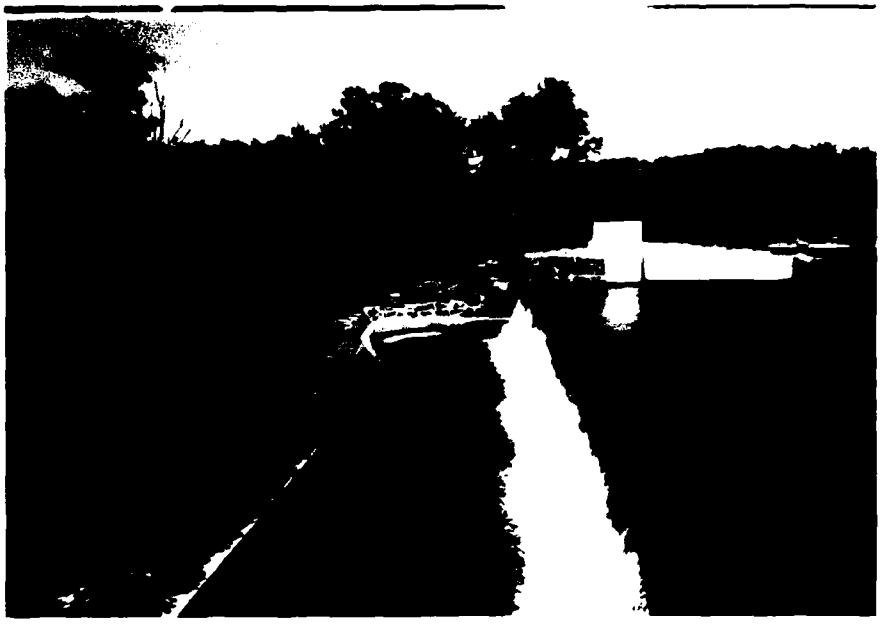
SELECTED PHOTOS



PLAN

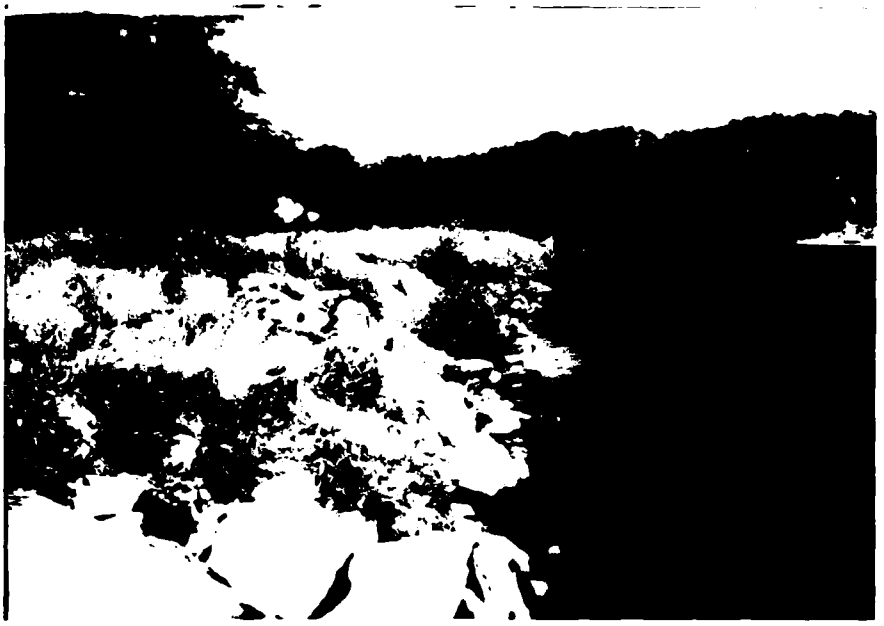
PACHAUG POND DAM
PHOTO INDEX

PLATE NC 4



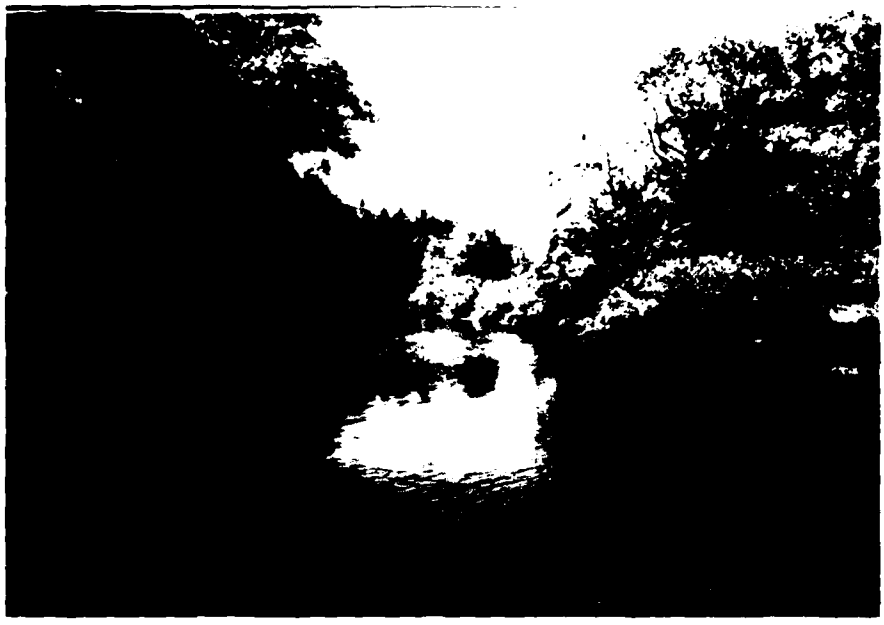
C-3 SPILLWAY CREST, RIGHT TRAINING WALL, GATEHOUSE AND DOWNSTREAM STILLING BASIN

C-4 SPILLWAY CREST, DOWNSTREAM CHANNEL BED AND LEFT TRAINING WALL



C-5 UPSTREAM FACE OF EARTH EMBANKMENT – (*note localized areas filled with dumped stone*)

C-6 UPSTREAM FACE OF EARTH EMBANKMENT AT RIGHT ABUTMENT



C-7 DOWSTREAM CHANNEL

C-8 SEEPAGE AT DOWN-STREAM TOE - LEFT ABUTMENT

C-9 ROTTING TREE STUMP AT WATERLINE ON UPSTREAM TOE OF EMBANKMENT

C-10 TYPICAL ROTTING TREE STUMP ON DOWNSTREAM EMBANKMENT SLOPE

C-11 SEEPAGE POND AT DOWNSTREAM TOE OF EARTH EMBANKMENT

C-12 DOWNSTREAM FACE OF EARTH EMBANKMENT. (note: seepage area to right below level of inspector standing on slope.)

C-13 DUMPED STONE ON DOWNSTREAM SLOPE

APPENDIX D

HYDROLOGIC COMPUTATIONS

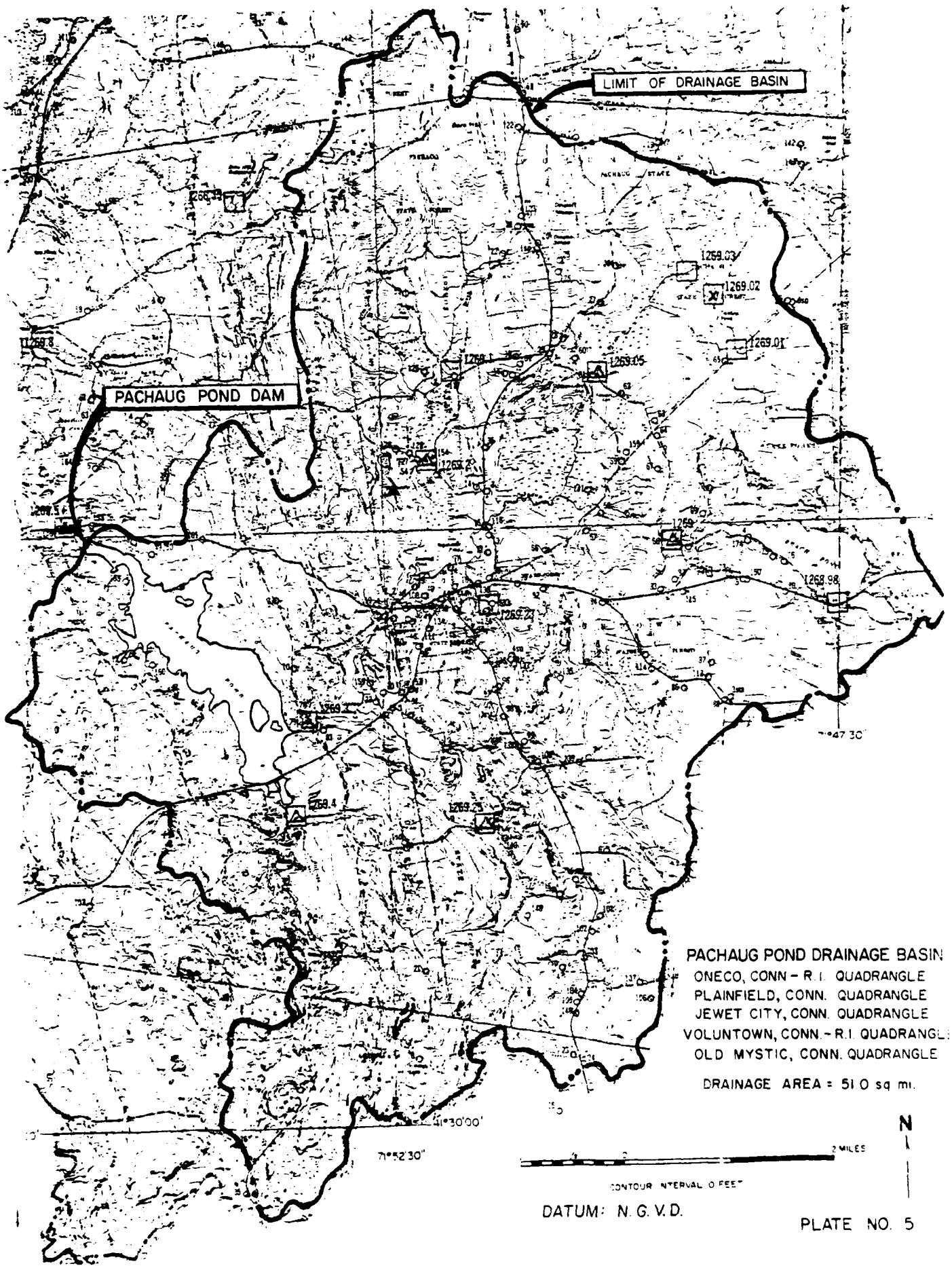

LIMIT OF DRAINAGE BASIN
PACHAUG POND DAM
1269.03
1269.02
1269.01
1269.05
1268.98
71°47'30"
41°30'00"
71°52'30"
PACHAUG POND DRAINAGE BASIN
ONECO, CONN - R.I. QUADRANGLE
PLAINFIELD, CONN. QUADRANGLE
JEWET CITY, CONN. QUADRANGLE
VOLUNTOWN, CONN. - R.I. QUADRANGLE
OLD MYSTIC, CONN. QUADRANGLE
DRAINAGE AREA = 51.0 sq mi.
N
2 MILES
CONTOUR INTERVAL 0 FEET
DATUM: N.G.V.D.

PLATE NO. 5

A. Size Classification

Height of Dam = 18.0 feet; Hence SMALL

at crest elevation reservoir storage = 5980 AC-ft., hence INTERMEDIATE

adopted size category INTERMEDIATE

B. Hazard Potential

IT IS LOCATED IN PREDOMINANTLY RURAL OR AGRICULTURAL AREA, BUT FAILURE OF DAM CAN CAUSE A SUBSTANTIAL DAMAGE TO LIFE AND PROPERTY BESIDES LOSS DUE TO RECREATIONAL FACILITIES AND ITS FLOOD CONTROL POTENTIAL. FOR DOWNSTREAM DAMAGES, THE FAILURE OF THE DAM HAS A DISTINCT POTENTIAL OF WASHING OUT RT. 138 AND ADVERSELY AFFECTING JEWETT CITY.

It is estimated from the rule of "thumb" failure hydrograph as follows:

Category	Loss of Life	Economic Loss
		Homes = YES
SIGNIFICANT	YES	Buildings = YES
		Farms = YES
		Miscellaneous = YES
		Highways or roads = YES

Hazard	Size	"Test Flood" or Spillway Design Flood
HIGH	INTERMEDIATE	PMF

Adopted Spillway Test Flood = PMF

Spillway width of test flood based on hydraulic characteristics = 500 CSM

Estimating Maximum Probable Discharges - Inflow and Outflow Values Date of Inspection: 5/22/78

Name of Dam PACHAUG POND DAM ; Location of Dam PACHAUG RIVER Town GRISWOLD, CT.

Watershed Characterization ROLLING WITH FLAT SWAMPS AND RESERVOIRS (ASSUMED FLAT AND COASTAL)

Adopted "test" flood = ONE PMF = 500 CSM = 25500 C.F.S.

D.A. = Drainage Area = 51.0 Square Miles = Acres

S.A. = Surface Area of Reservoir = 1.297 Square Miles = 830 Acres AT CREST OF SPILLWAY

Shape and Type of Spillway = BROAD CRESTED, OGEE TYPE; OVERFLOW - UNCONTROLLED

B = Width of Spillway = 121.0 feet; C = Coefficient of Discharge = (3.83 - Friction) = 3.60

Maximum Capacity of Spillway Without Overstopping = 6400 C.F.S. = 25.1 % of test Q

Top of Dam Elevation = 167.00 ; Spillway Crest Elevation = 161.00

Length of Dam= 770 feet

Name of Dam	Test Flood Qp_1 CSM	Qp_1 CFS	Inflow Characteristics h_1 in feet	S_1 in inc.	Outflow Characteristics First Approximation Qp_2 CFS	h_2 in feet	S_2 in inc	Outflow Characteristics Second Approximation S_3 in inc	h_3 in ft.	Qp_3 CFS	Outflow Characteristics Third Approximation S_4 in inc.	h_4 in ft.	Qp_4 CFS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
PACHAUG POND DAM	500	25500	10.08	3.08	25500	10.08	3.08	3.02	9.89	24163	3.05	9.99 = 10.0	24800
	250	12750	7.96	2.43	12750	7.96	2.43	2.40	7.86	12242	2.42	7.90	12300

Qp = Discharge; h = Surcharge height S = Storage in inches

Overtopping Potential

Spillway crest elevation = 161.0 M.S.L.

Top of dam elevation = 167.0 M.S.L.

Maximum discharge capacity of Spillway without overtopping = 6400 C.F.S.

"Test flood" outflow discharge = 24800 C.F.S.

% of "Test flood" carried by Spillway without overtopping = 25.7 1

"Test flood" outflow discharge which flows over the dam = 18400 C.F.S.

= 74.3 % of "Test flood" 2

1 + 2 = 100%

"Rule of Thumb Guidance for Estimating
Downstream Dam Failure Hydrograph"

BASIC DATA

Name of dam Pachaug Pond Dam Name of town Griswold - Conn

Drainage area = 51.0 sq m. Top of dam 167.0 NGVD

Spillway type = Broad crest-ogee-overflow crest of spillway 161.0 NGVD

Surface area at crest elevation = 5982 Acres

Reservoir bottom near dam = 151.0 NGVD

Assumed side slopes of embankments = 2:1

Depth of reservoir at dam site 16.0 ft = y_o = 16.0 ft.

Mid-height elevation of dam = 159.0 NGVD

Length of dam at crest = 521 feet

Length of dam at mid-height = 489 feet

40% of dam length at mid-height = W_b = 195 feet ft.

Stream height of dam = 18 feet

Hydraulic height of dam = 16 feet

Step 1:

Elevation M.S.L.	Reservoir Estimated Storage In AC-ft.	Remarks
161.0	5982	
163.0	7642	2×830
165.0	9302	
167.0	10962	
169.0	12622	
171.0	14282	

Step 2:

$$Q_{pl} = \frac{3}{27} W_b \sqrt{g}\, y_o^{3/2}$$

$$= 1.68\, W_b\, y_o^{3/2} = 20966 \text{ C.F.S.}$$

Step 3:

Appendix - D

Reach	Length in Feet	Stage	Discharge	Remarks
L_{1-2}	1600 --	164	-- 23710	See Appendix D-5
"	"	159	7440	
L_{2-3}	7400	144.2	18590	
"	"	140.2	5658	
L_{3-4}	8000	123	17280	
"	"	120	5440	
L_{4-5}	7000	114.5	13500	
"	"	112.5	5070	

Notes:

1. Point 1 is at the dam and L_{1-2} is the length from the centerline of Dam to the first cross section
2. Lengths are approximate because 1"=2000' scale USGS topo maps are used
3. For values of discharges other than in the Table above, linear interpolation and extrapolation is assumed

Step 4:

Reach Length 1-2

A) Q_{p1} = 20965 [a] CFS

Stage = 163.15

A_1 = Area = 2745 sq. ft. = ____

Length = L_{1-2} = 1600 ft.

V_1 = ____ cu. ft. = 100.8 AC-ft.

S = 7700 AC-ft.

$\frac{V_1}{S}$ = 0.013 less than 0.5; O.K.

B Q_{p2} (Trial) = Q_{p1} $(1 - \frac{V_1}{S})$ = 20690 CFS

C) Stage for Q_{p-2} = 163.17

Area = 2741 sq. ft.

L_{1-2} = Length = 1600 ft.

V_2 = 100.5 AC-ft.

S = 7700 AC-ft.

$\frac{V_2}{S}$ = 0.013 less than 0.5; O.K.

D $\frac{V_1 + V_2}{2} = V_{avg}$ = 0.013 AC-ft.

$Q_{p-2} = Q_{p-1} (1 - \frac{V}{S}avg)$

= 20690 CFS

Stage for Q_{p-2} = 163.00

Stream Bed Elevation = ...

Depth of flow = -9.0 feet

Step 5:

Reach Length 2-3

Q_{p2} = 20690 CFS

Stage = 144.53

A_1 = Area = 3332 sq. ft. = ____ AC-ft.

Length = L_{2-3} = 7400 ft.

V_2 = ____ cu. ft. = 549 AC-ft.

S = 7700 AC-ft.

$\frac{V_2}{S}$ = 0.071 less than 0.5; O.K.

Q_{p-3} (Trial) = Q_{p-2} $(1 - \frac{V_2}{S})$ = 19220 CFS

Stage for Q_{p-3} = 144.30

Area = 3240 sq. ft.

L_{2-3} = length = 7400 ft.

V_3 = 550 AC-ft.

S = 7700 AC-ft.

$\frac{V_3}{S}$ = 0.071 less than 0.5; O.K.

$\frac{V_2 + V_3}{2} = V_{avg}$ = 0.071 AC-ft.

$Q_{p-3} = Q_{p-2} (1 - \frac{V}{S}avg)$

= 19220 CFS

Stage for Q_{p-3} = 144.3

Stream Bed Elevation = 130.0

Depth of flow = 14.3 feet

a: Linearly interpolated and or extrapolated from page D-2

Step 4 (con't): Reach Length 3-4

A) Q_{p-3} = 19200 CFS

Stage = 123.48 = 123.5

Area = 3900 sq. ft. = ____

Length = L_{3-4} = 7000 ft.

V_3 = ____ cu. ft. = 716 AC-ft.

S = 7700 AC-ft.

$\frac{V_3}{S}$ = 0.093 less than 0.5; O.K.
= 0.10

B Q_{p-4} (Trial) = Q_{p-3} $(1 - \frac{V}{S}3)$ = 17300 CFS

C) Stage for Q_{p-4} = 123

Area = 3600

L_{3-4} = 7000 ft.

V_4 = 661 AC-ft.

S = 7700 AC-ft.

$\frac{V_4}{S}$ = 0.095 less than 0.5; O.K.

$\frac{V_3 + V_4}{2}$ = V_{avg} = 0.09 AC-ft.

$Q_{p-4} = Q_{p-3} (1 - \frac{V}{S}avg)$

= 17470 CFS

Stage for Q_{p-4} = 123.10

Stream Bed Elevation = 117.2

Depth of flow = 5.90 ft.

Step 5 (con't): Reach Length 4-5

Q_{p-4} = 17470 CFS

Stage = 115.4

Area = 4450 sq. ft. = ____ AC-ft.

Length = L_{4-5} = 7000 ft.

V_4 = ____ cu. ft. = 1241 AC-ft.

S = 7700 AC-ft.

$\frac{V_4}{S}$ = 0.135 less than 0.5; O.K.

Q_{p-5} (Trial) = Q_{p-4} $(1 - \frac{V_4}{S})$ = 15110 CFS

Stage for Q_{p-5} = 114.80

Area = 5520

L_{4-5} = 7000 ft.

V_5 = 2425 AC-ft.

S = 7700 AC-ft.

$\frac{V_5}{S}$ = 0.122 less than 0.5; O.K.

$\frac{V_4 + V_5}{2}$ = V_{avg} = 0.129 AC-ft.

$Q_{p-5} = Q_{p-4} (1 - \frac{V}{S}avg)$

= 15200 CFS

Stage for Q_{p-5} = 114.5

Stream Bed Elevation = 110.0

Depth of flow = 4.5 ft.

Step 3:

Reach No.	Distance in Feet	Mean Slope	Adopted "n"	Stage = 164					Stage = [illegible]					Stage =
				A	P	R	V	Q	A	P	R	V	Q	
1-2	L_{1-2} = 1600'	0.0033	0.05	3000	300	10	7.51	23710	1500	300	5	4.96	7440	
					Stage = 144.2					Stage	140.2			
2-3	L_{2-3} = 7400'	0.0024	"	3200	400	8	5.81	18590	1600	400	4	3.66	[illegible]	
						Stage =	123			Stage =	120.0			
3-4	L_{3-4} = 8000'	0.0024	"	3600	600	6.0	4.80	17280	1800	600	3.0	3.02	5440	
						Stage	114.5			Stage :	112.5			
4-5	L_{4-5} = 7000'	0.00095 ≈0.001	"	5400	1200	4.5	2.50	13500	3000	1200	2.5	1.69	[illegible]	
5-6	L_{5-6} =													

Notes: 1 Reach No 1 is at the Dam.

2 "n" value is weighted Mannings roughness Coefficient

3 Because of large sidewidth in Channel, depth = R and B. P

Storage Elevation Estimation Procedure

Elevation	Depth in Feet	Area Acres	Storage Capacity AC-ft. Increment	Storage Capacity AC-ft. Cumulation
161.0	— varies —	830	—	5982
163.0	— — —	"	1660	7642
165.0	— — —	"	"	9302
167.0	— — —	"	"	10962
169.0	— —	"	"	12622
171.0	— —	"	"	14282
173.0	— —	"	"	15942
175.0	— —	"	"	17602

Notes: a. Actual field survey of Elevation – Area – Storage curve is not available and the value is based on sketchy available information without verification

b. 930 Acres-ft of storage capacity is assumed constant for every additional foot of increase in elevation above crest elevation

PROJECT PACHAUG POND DAM — ACC. NO. 3155.000

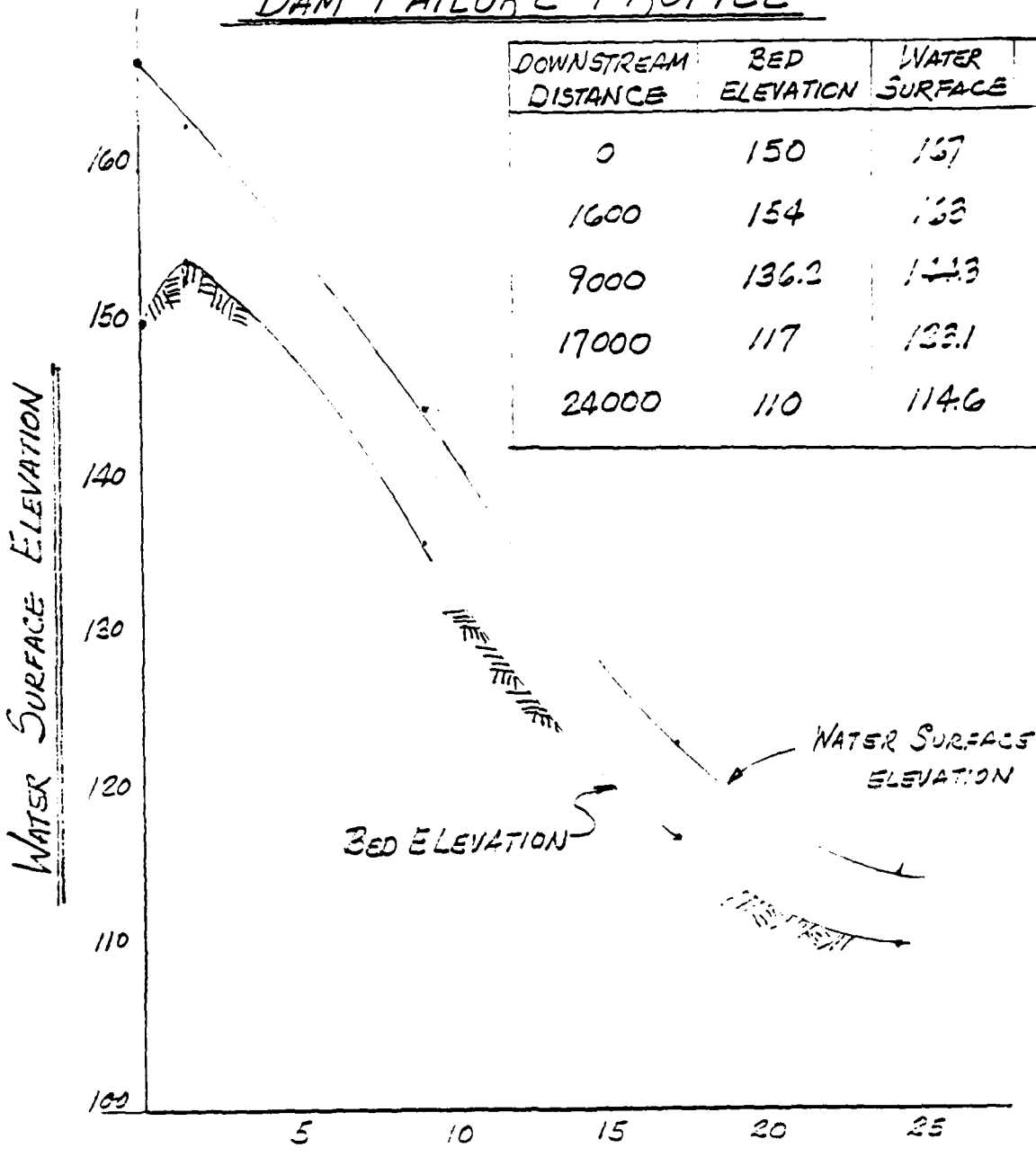
SUBJECT DAM FAILURE D/S PROFILE — SHEET NO. ___ OF ___

DATE ___ 19__

COMP. HR. — CHECK ___ — CONT. NO. ___

DAM FAILURE PROFILE

DOWNSTREAM DISTANCE	BED ELEVATION	WATER SURFACE	Q CFS
0	150	157	20700
1600	154	155	20690
9000	136.2	143	19200
17000	117	133.1	17470
24000	110	114.6	15200



DOWNSTREAM DISTANCE IN (1000) FT

PROJECT: PACHAUG POND DAM — ACC. NO. [illegible]

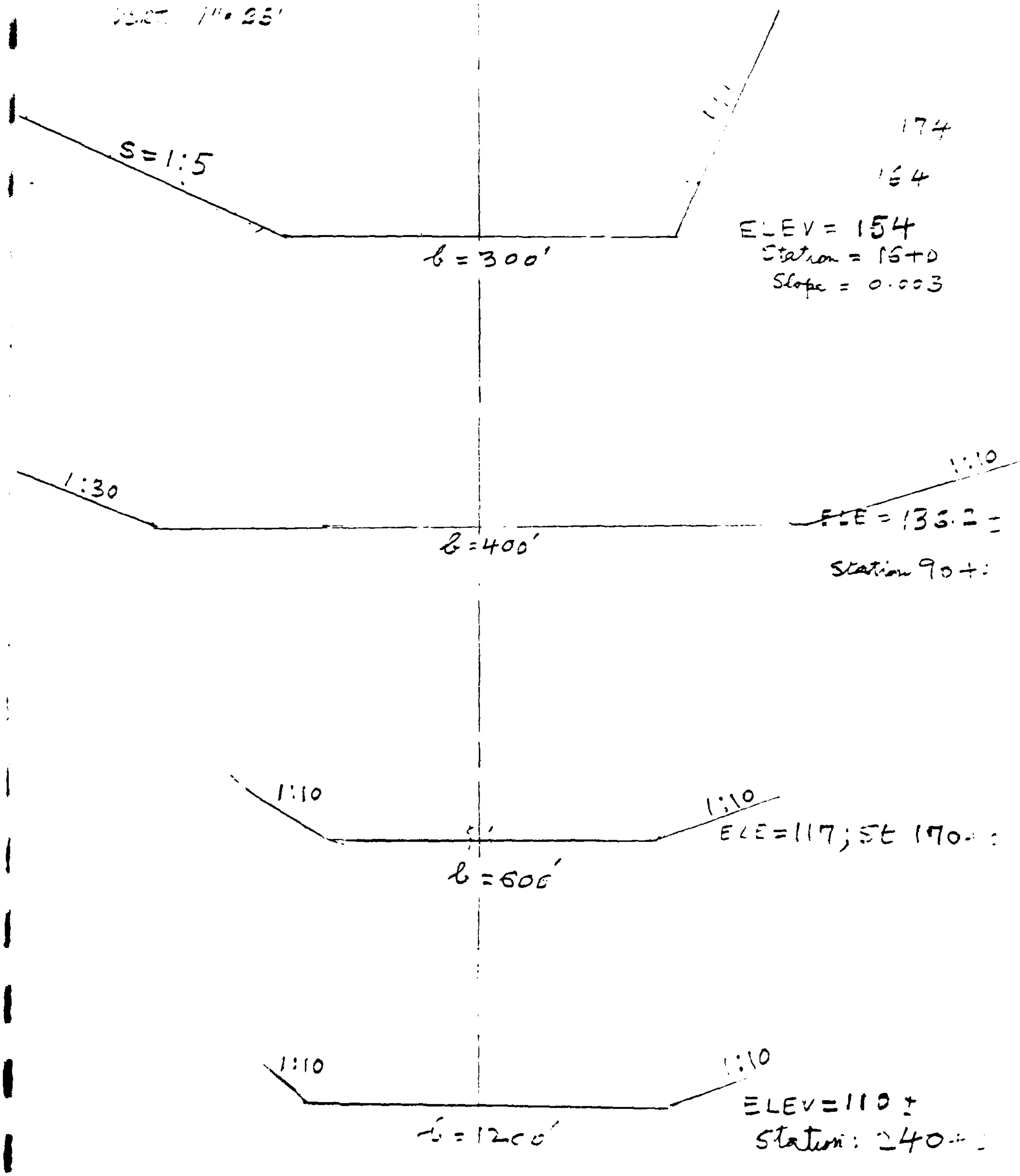
SUBJECT: DAM FAILURE PROFILE X-SECTIONS — SHEET NO. ___ OF ___

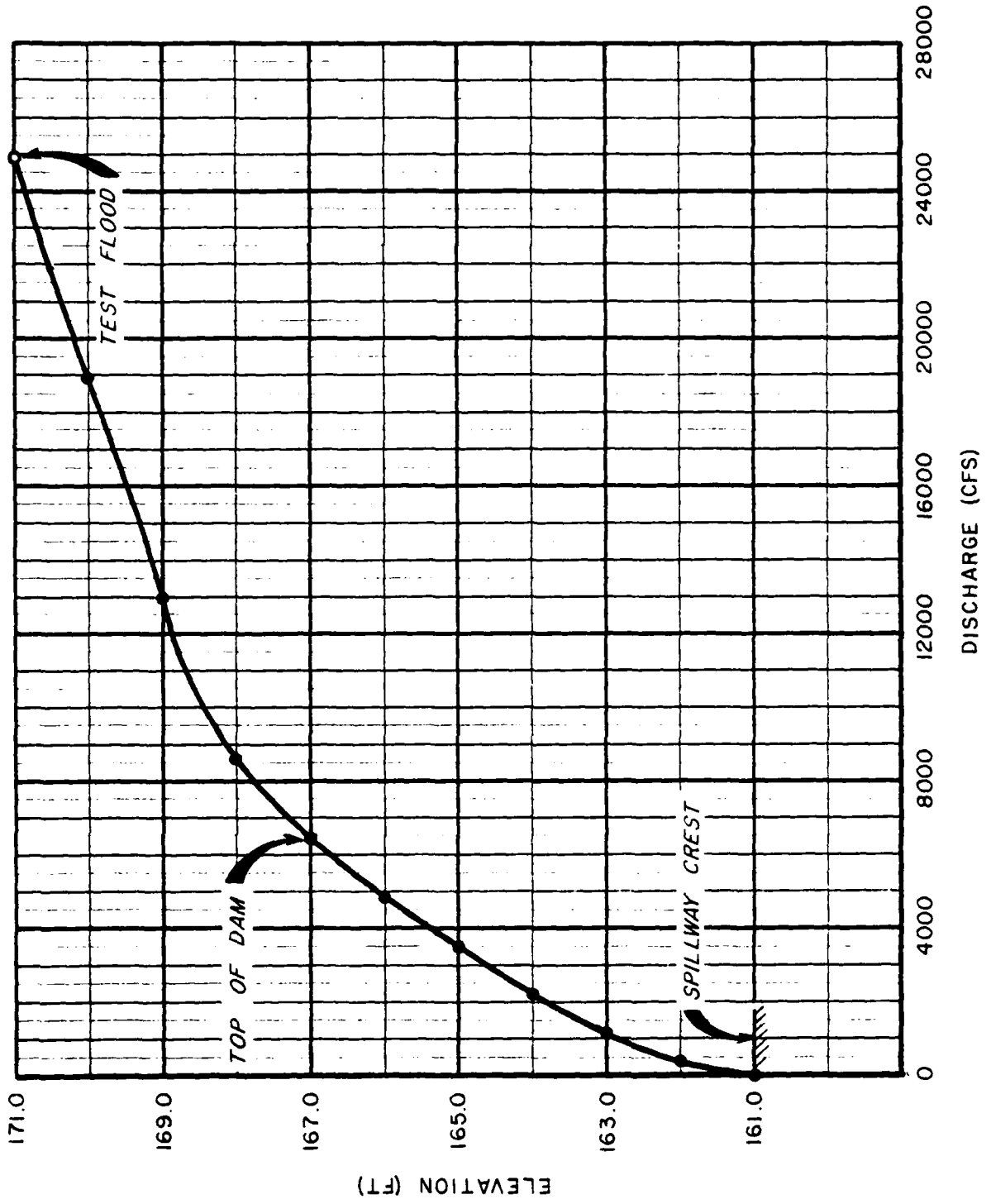
DATE ______ 19__

COMP. ______ CHECK ______ CONT. NO. ______

SCALE

HORZ 1" = 100'
VERT 1" = 25'





SPILLWAY RATING CURVE
PACHAUG POND DAM

APPENDIX E

INVENTORY FORMS

PART I – INVENTORY OF DAMS IN THE UNITED STATES

(PURSUANT TO PUBLIC LAW 92-367)

See reverse side for instructions

[2] [3] [4] [5] [6] [7] [8] [9]

IDENTIFICATION	DIVISION	STATE	COUNTY	CONGR DIST	STATE	COUNTY	CONGR DIST	NAME
	NED	CT	011	02				PACHAUG POND DAM

[13]

IDENTIFICATION *(Continued)*	POPULAR NAME
	PACHAUG

[15] [16] [17]

LOCATION	REGION	BASIN	RIVER OR STREAM	CITY
	01	07	PACHAUG RIVER	JEWETT CITY

[21] [22] [23] [24] [25] [26]

STATISTICS	TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (ft)	HYDRAULIC HEIGHT (ft)	IMPOUNDING CAPACITY MAXIMUM (acre – ft.)
	REØT	1888	R	17	17	10962

[28]

REMARKS	REMARKS
	20-1977ESTIMATE 21-MASØNRY 22-ESTIMATE

ENG FORM 1 DEC 77 4474

UNITED STATES

)-3671)

STATE					
C	T			6 6	3

[9] [10] [11] [12]

NAME	LATITUDE (North)	LONGITUDE (West)	REPORT DATE DAY MO YR	
DAM	41 34.9	71 55.8	22 MAY 78	0

[14]

	NAME OF IMPOUNDMENT	
	PACHAUG PØND	1

[18] [19] [20]

	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST. FROM DAM (mi)	POPULATION	
	JEWETT CITY	5	3414	2

[25] [26] [27] [27A] [27B] [27C] [27D] [27E] [27F]

	HYDRAULIC HEIGHT (ft)	IMPOUNDING CAPACITIES MAXIMUM (acre - ft.)	NORMAL (acre - ft.)	CORPS ENGR. DIST.	OWN.	FED. R.	PRV/FED	SCS A.	VERIFICATION DATE DA MO YR	BLANK	
7	17	10962	5982	NED	N	N	N	N	19 JUL 78		3

[28]

REMARKS	
- ESTIMATE	4

PART II – INVENTORY OF DAMS IN THE UNITED STATES
(PURSUANT TO PUBLIC LAW 92-367)

See reverse side for instruction

[29] [30] [31] [32] [33] [34] [35] [36] [37] [38]

STATISTICS

D S HAZ	CREST LENGTH (ft)	SPILLWAY TYPE	SPILLWAY WIDTH (ft)	SPILLWAY MAXIMUM DISCHARGE (cfs)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NO	LENGTH (ft)
1	600	U	121	6400					

[46] [47]

MISC DATA

OWNER	ENGINEERING BY
STATE OF CT	UNKNOWN

[49] [50]

MISC. DATA (Continued)

REGULATORY AGENCY: DESIGN	REGULATORY AGENCY: CONSTRUCTION	REGULATORY AGENCY: OP
UNKNOWN	UNKNOWN	NONE

[53] [54]

MISC. DATA (Continued)

INSPECTION BY	INSPECTION DATE DAY	MO	YR
CE MAGUIRE INC	22	MAY	78

[56]

REMARKS

REMARKS

ENG FORM 1 DEC 77 4474A

TED STATES

STATE	INVENTORY NUMBER
CT	663

[36] [37] [38] [39] [40] [41] [42] [43] [44] [45]

LLED (MW)	PROPOSED (MW)	NO	LENGTH (ft)	WIDTH (ft)	LENGTH (ft)	WIDTH (ft)	LENGTH (ft)	WIDTH (ft)	LENGTH (ft)	WIDTH (ft)	BLANK
											5

OWER CAPACITY — NAVIGATION LOCKS

[47] [48]

ENGINEERING BY	CONSTRUCTION BY
N	UNKNØWN

[51] [52]

REGULATORY AGENCY	OPERATION	MAINTENANCE
	NØNE	NØNE

[54] [55]

INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
22	MAY	78	PL 92-367

[56]

REMARKS

PART III - INVENTORY OF DAMS IN THE UNITED STA
SUPPLEMENTARY DATA

	(A-1) TOWN	(A-2) N.E.D. PERMIT NO.	(A-3) STATE NUMBER	(A-4) F.E.R.C. NO
LOCATION	GRISWOLD			

	(B-1) DRAINAGE AREA SQ. MI.	(B-2) FLOW DATA MIN. C.F.S.	(B-3) FLOW DATA AVE. C.F.S.	(B-4) FLOW DATA MAX. C.F.S.	(B-5) CREST ELEV. M.S.L.	(B-6) ABUT. ELEV. M.S.L.	(B-7) USABLE STORAGE ACRE FEET	(B-) RESER AR ACR
DRAINAGE CHARACTER-ISTICS	51		6400	161	167	5982		

	(C-1) GENERATION UNITS INSTALLED NO.	(C-1) GENERATION UNITS INSTALLED CAP. K.W.	(C-2) GENERATION UNITS PLANNED NO.	(C-2) GENERATION UNITS PLANNED CAP. K.W.	(C-3) AVERAGE ANNUAL GENERATION K.W.H.	(C-4) LAST GEN. YEAR	(C-5) RETIRED YEAR	(C-6) FORMER USE	(C) CAP FA
POWER DATA	0		0						

5 IN THE UNITED STATES
RY DATA

2

CT 663

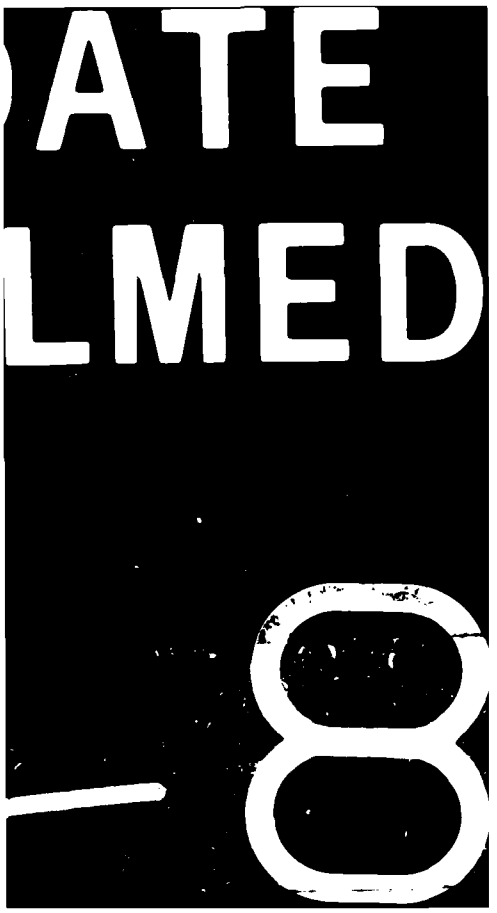
(A-3) STATE NUMBER	(A-4) F.E.R.C. NO.	(A-5) U.S.G.S. SHEET	
		JEWETT CITY CONN	A

(B-7) USABLE STORAGE ACRE FEET	(B-8) RESERVOIR AREA ACRES	(B-9) FLASH BOARD HT FEET	(B-10) OUTLET CONDUITS NO.	(B-11) OUTLET CONDUITS SIZE	(B-12) INVERT ELEV. M.S.L.	
5982	830	0	1	3FT X 4FT	147	B

(C-5) RETIRED YEAR	(C-6) FORMER USE	(C-7) CAPACITY FACTOR	
			C

D

E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